January 11, 1930 *A McGraw-Hill Publication* 25 Cents per Copy

AVIATION

The Oldest American Aeronautical Magazine

TACOMA PUBLIC LIBRARY

AMERICAN *Sales* POSSIBILITIES IN *Europe*

THE AIRPORT PROBLEM IN *New York City*

THE CONSOLIDATED *"Commodore"*

TESTED, RETESTED—AND FINALLY APPROVED

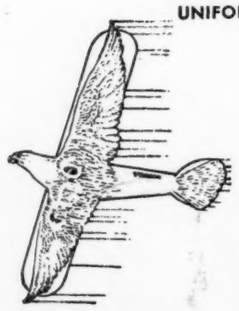
STANAVO THE NEW AVIATION ENGINE OIL, IS WINNING THE ENDORSEMENT OF FLIERS FROM COAST TO COAST . . .

CHANCE played no part in the development of STANAVO, a superior aviation engine oil produced by the leading experts and engineers of the Standard Oil Company of California — Standard Oil Company (Indiana) — Standard Oil Company of New Jersey.

Hundreds of rigid laboratory tests — the test of hundreds of flying hours under all conditions — were performed before the Stanavo Specification Board, Inc., was satisfied that Stanavo Aviation Engine Oil was an oil of a QUALITY, UNIFORMITY AND STAMINA HITHERTO UNKNOWN.

In all tests — long flights, short flights, altitude, climatic, unusual installation, different motors and planes—Stanavo proved its quality so convincingly that it is now offered for general use by these three makers of petroleum products with absolute confidence that the world of aviation will find it unsurpassed.

Today aviators are finding Stanavo from coast to coast an absolutely uniform aviation engine oil, of the best viscosity temperature relationship and lasting qualities—an oil of greater stamina which after 25 to 30 hours' use is often found cleaner and better than the average new oil.



STANAVO
AVIATION ENGINE OIL

One Brand—STANAVO. One Quality—the Highest, Throughout the World.

STANAVO SPECIFICATION BOARD, Inc.

1911 Chanin Building—122 East 42nd Street, New York City

AVIATION. January 11, 1930. Vol. No. 28, No. 2. Published weekly. McGraw-Hill Publishing Company, Inc., Tenth Avenue at 36th Street, New York, N. Y. Domestic $5.00 per year. Canada and Mexico $5.00. Central and South America, $6.00 a year. All other countries, $8.00; 25 cents a copy. Entered as second-class matter July 27, 1928, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

R. SIDNEY BOWEN, JR.
Associate Editor

LESLIE E. NEVILLE
Technical Editor

DEANE DAVENPORT

DAVID J. LEISK

CHARLES F. McREYNOLDS
Pacific Coast Editor

AVIATION

The Oldest American Aeronautical Magazine

EDWARD P. WARNER, *Editor*

JAMES H. McGRAW, JR., *Publishing Director*

HERBERT F. POWELL
News Editor

EARL D. OSBORN
Contributing Editor

CHARLES H. GALE

CHARLES E. NOYES

JOHN T. NEVILL
Detroit Editor

Contents for January 11, 1930

VOLUME 28, NUMBER 2

Copyright, 1930, by McGraw-Hill Publishing Company, Inc.

European Aeronautics and American Foreign Sales Possibilities **44**
An interview with Leroy Manning, pilot of the Ford plane that toured Europe last summer, on his observations there. — BY JOHN T. NEVILL

The Consolidated "Commodore" Flying Boat **49**
A technical description of the Consolidated Model 16, twelve of which are now under production. — BY LESLIE E. NEVILLE

The Airport Problem in New York City **56**
The first of a series of three articles analyzing the typical problem of landing space in a great city. — BY JOHN C. HOLME, JR.

The Shielding Effect of N.A.C.A. Cowlings **59**
Results of tests by the Radio Frequency Laboratories of the effects of cowlings in reducing ignition interference. — BY F. H. DRAKE AND A. W. PARKES, JR.

Construction of Airfoil Sections and Wing Generation **61**
The first of two articles discribing a systematic method of designing an airfoil section with desired characteristics. — BY JEAN FRADISS AND ARMAND THIEBLOT

A Comparison of England's Two New Aircraft **65**
A description of the recently launched R. 100 and a comparison with the R. 101. — BY AVIATION'S BRITISH CORRESPONDENT

EDITORIALS 41
GENERAL NEWS 69
AIRPORTS AND AIRLINES 76
FOREIGN ACTIVITIES 82
WHAT OUR READERS SAY 85
NEW VOLUMES FOR THE SHELVES .. 86
ABSTRACTS AND REVIEWS 86
NEW PATENTS 88
THE BUYERS' LOG BOOK 89
SIDE SLIPS 90

COMING

A series of six articles on the work of the newly formed Licensing and Inspection Division of the Aëronautics Branch. ¶An analysis of aircraft demand—past, present and future. ¶Coming descriptions—the new Junkers giant, Curtiss Condor

McGRAW-HILL PUBLISHING COMPANY, INC., Tenth Ave. at 36th St., New York, N. Y.

CABLE ADDRESS: "MACHINIST, N. Y."

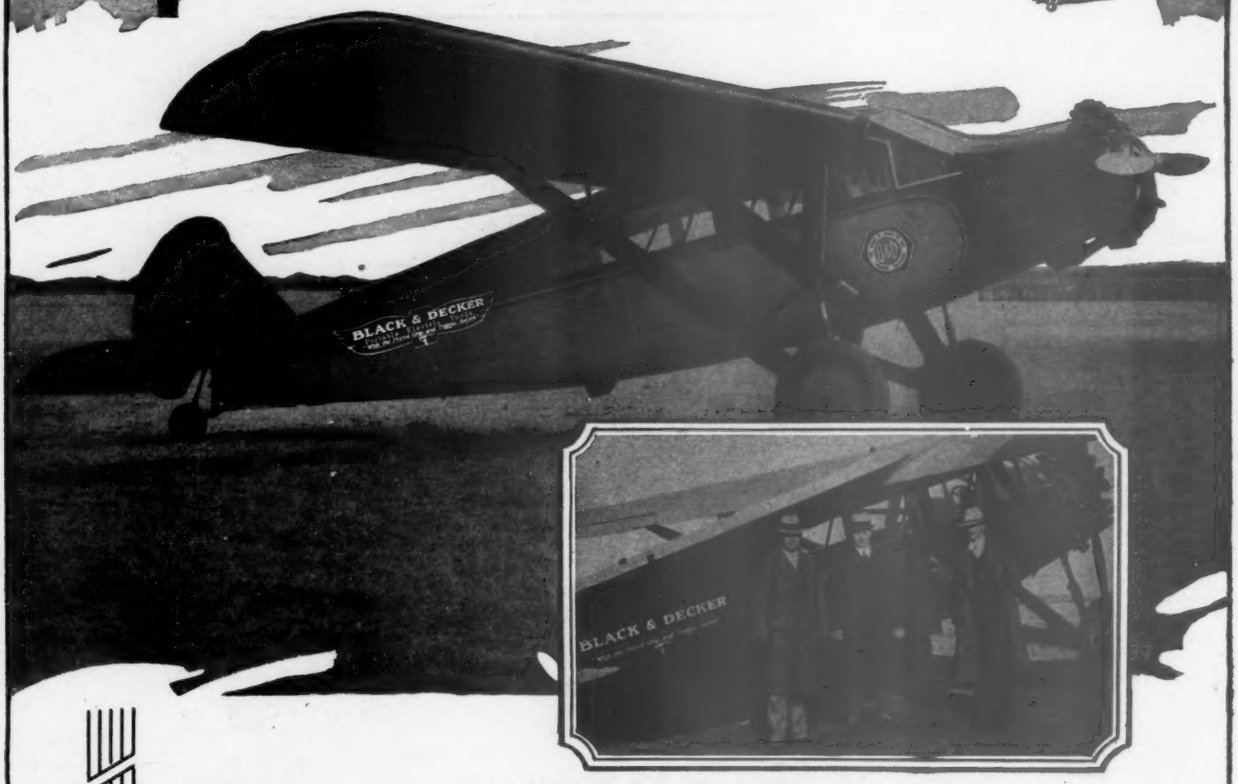
JAMES H. McGRAW, *Chairman of the Board*
MALCOLM MUIR, *President*
JAMES H. McGRAW, JR., *Vice-Pres. and Treas.*
EDWARD J. MEHREN, *Vice-President*
MASON BRITTON, *Vice-President*
EDGAR KOBAK, *Vice-President*
HAROLD W. McGRAW, *Vice-President*
H. C. PARMELEE, *Editorial Director*
C. H. THOMPSON, *Secretary*

Member A.B.C.

NEW YORK, *District Office, 285 Madison Avenue*
WASHINGTON, *National Press Building*
CHICAGO, *520 N. Michigan Avenue*
GREENVILLE, S. C., *1301 Woodside Bldg.*
BOSTON, *1427 Statler Building*
PHILADELPHIA, *1600 Arch Street*
DETROIT, *4-257 General Motors Bldg.*
CLEVELAND, *Guardian Building*
ST. LOUIS, *Bell Telephone Building*
SAN FRANCISCO, *883 Mission Street*
LOS ANGELES, *632 Chamber of Commerce Building*
LONDON, *5 Bouverie Street, London, E. C. 4*

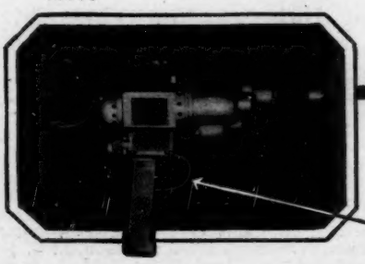
TACOMA PUBLIC LIBRARY

BLACK & DECKER "Takes to the Air"



IN order to appropriately contact the Aircraft Industry and at the same time obtain the "feel of the air" The Black & Decker Mfg. Co. has established an Aviation Sales Department and equipped this department with a six placed closed plane, which will tour the airports of the country. This plane will be equipped with a complete line of electric tools applicable to the Aircraft Industry and will be flown by a thoroughly trained salesman and demonstrator, who is an experienced transport pilot.

We feel sure that the industry will enthusiastically cooperate in our work of developing and supplying electric tools particularly adapted to the specialized work of the industry.



The BLACK & DECKER MFG. CO.
TOWSON, MD.
Slough, Bucks., England — Toronto, Ontario, Canada

"With the Pistol Grip and Trigger Switch"

GETTING OFF TO A GOOD START

THE pilot who shoves off with -TP- Aero Motor Lubricating Oil in his engine has this advantage: he knows he is not going to have to worry about his oil. He has side-stepped a lot of unnecessary risks.

-TP- Oils are new—the latest development in scientific lubrication. They have been tested and approved by leading manufacturers of airplane engines and by many leading pilots. They are straight-run oils, not blended or compounded, produced from pure, paraffine-base crude by a process for which patents are pending.

This process has marked advantages over other methods. It removes all the paraffine wax, while preserving all the lubricating bodies in the crude. Elimination of the wax is responsible for its low cold test.

In terms of performance this means uniform viscosity at all working temperatures, minimum carbon deposit and ignition trouble from fouled spark plugs, easy cold priming, immediate oil pressure, perfect lubrication winter and summer, on the ground or at high altitudes—a maximum of safe flying hours.

A handsome, practical *Pilot's Log Book* sent free on request.

Ohio
It's
-TP- SOHIO
Aero Motor
Lubricating Oil

Marketed in
Ohio
Exclusively by
The Standard Oil
Company of Ohio

-TP- Aero
Valve Spring
Lubricant

Also
-TP- Aero
Rocker Arm
Lubricant

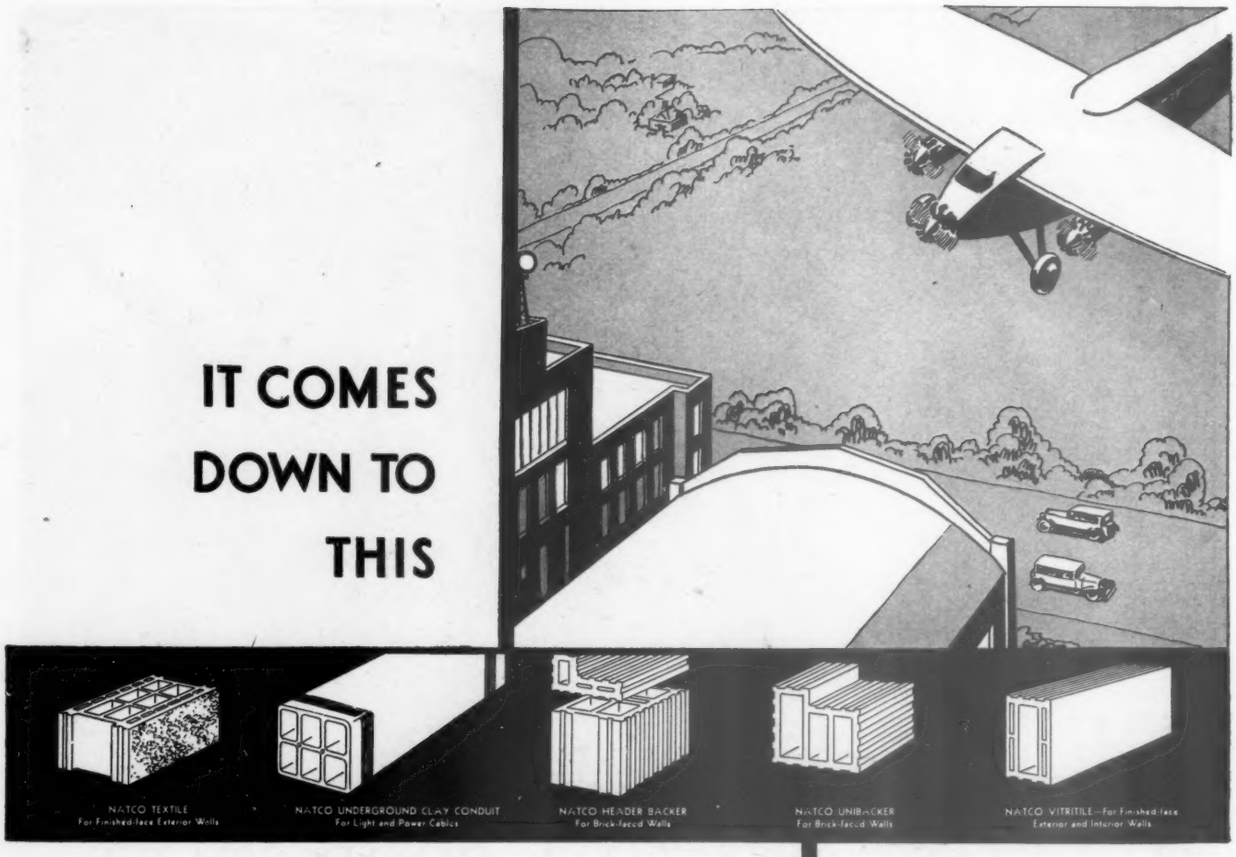
TEXAS PACIFIC COAL AND OIL COMPANY
FORT WORTH, TEXAS
New York St. Louis Los Angeles

-TP-AERO MOTOR LUBRICATING OIL

REG. U. S. PAT. OFF.

2779

IT COMES DOWN TO THIS



You can't hitch a tractor on your air port and move it into the next county—once in, it's there to stay . . .

Since its location is permanent, why not make its buildings permanent? Natco Structural Clay Tile lets you keep initial costs down to a minimum—cash in each year on savings in maintenance, insurance, and depreciation. Check the advantages below. You *need* them all—you *get* them all, through Natco.

1. FIRE SAFETY—Natco Structural Clay Tile are absolutely non-inflammable. They help confine a fire and permit a maximum of salvage.

2. ECONOMY—The large, easily handled units are laid at sizable savings in time, labor, mortar and expense.

3. SPEEDY CONSTRUCTION—Each Natco tile is equivalent in volume to several brick. Structures go up in a hurry, are quickly ready for use.

4. PERMANENCE—Natco Tile are permanent in character and form; never rust, rot, or warp.

5. LOW MAINTENANCE—Painting, patching and repair work, necessary with most forms of construction, are reduced to an absolute minimum.

6. LOW DEPRECIATION—Buildings built of Natco Structural Clay Tile are highly resistive to destruction and decay. Depreciation is usually figured at ½% a year.

7. DECREASED HEAT LOSS—All Natco Structural Clay Tile have high insulating value. Dead air spaces retard heat and cold to a great degree.

Write, wire, or consult the nearest office, for full details. Our engineering department will gladly cooperate with architects and contractors in airport planning and building.

NATCO
THE *COMPLETE* LINE *of*
STRUCTURAL CLAY TILE

NATIONAL · FIRE · PROOFING · CORPORATION
THE LARGEST CONCERN IN THE WORLD MAKING A COMPLETE LINE OF STRUCTURAL CLAY PRODUCTS
GENERAL OFFICES: FULTON BUILDING, PITTSBURGH, PA. BRANCHES: NEW YORK, CHANIN BUILDING; CHICAGO, BUILDERS BUILDING; PHILADELPHIA, TITLE BUILDING; BOSTON, TEXTILE BUILDING AND NATIONAL FIRE PROOFING COMPANY OF CANADA, LTD., TORONTO, ONTARIO

FLYING DOWN TO ECUADOR

Passing El Misti in the Peruvian Andes at 110 miles an hour

The Ford Plane

The Ford plane is planned, constructed and operated as a commercial plane. Built of corrugated aluminum alloys, it has great structural strength, unequaled durability, and is most economical to maintain in operation. The uniformity of its material is determined by scientific test. All planes have three motors in order to insure reserve power to meet and overcome all emergencies. The engines may be Wright or Pratt & Whitney, air-cooled, totaling from 900 to 1275 horse-power. Ford planes have a cruising range of from 580 to 650 miles at speeds between 55 and 135 miles per hour. Loads may be carried weighing from 3670 to 6000 pounds.

The human capacity of these planes is 13 to 15 passengers and a crew of two (pilot and assistant). Each plane is equipped with a buffet, toilet, running water, electric lights, adjustable chairs.

The price of the Ford tri-motored, all-metal plane is exceptionally low because of its highly scientific methods of commercial production. Price is $42,000 to $55,000 at Dearborn.

Ford branches will be glad to give you information on the Ford tri-motored, all-metal plane in all models.

A LITTLE MORE than a year ago we wrote as a prophetic statement that American air-lines would soon be reaching down to the mainland of South America! Today big tri-motored, all-metal Ford planes are not only reaching the mainland of South America, from Panama, the West Indies, and Florida, but they are flying on, farther and farther southward, where there are no roads, no trails, and man can only cross geographical barriers by taking wings across the sky. . . .

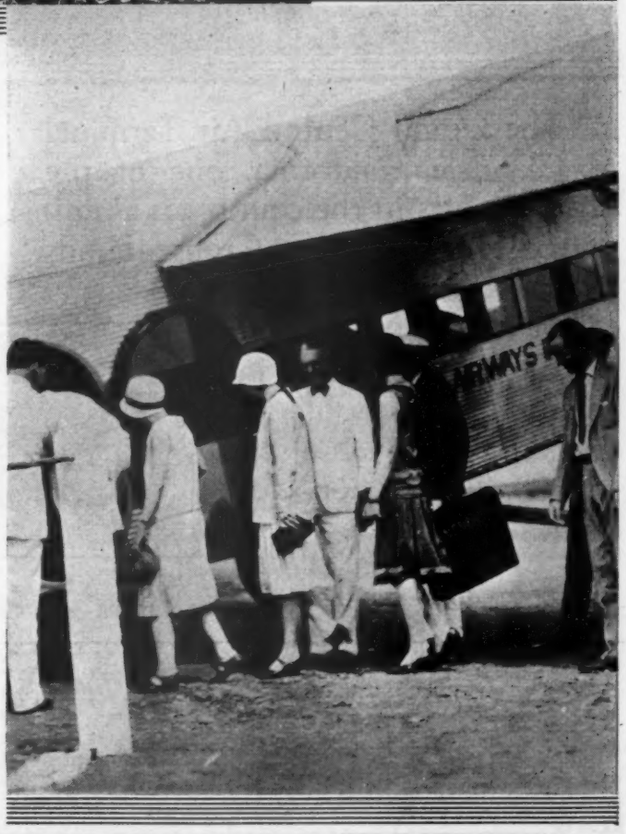
Pan-American air-liners, using only multiple-engined planes of large passenger capacity, are winging over the islands of the Gulf of Mexico and the countries of the mainland. Well-organized tours, operating in conjunction with railroads and steamships, reach Nassau, Mexico, Cuba, Haiti, Dominican Republic, Republic of Panama. In addition, there are 4000 miles of airways over which the Pan-American carries mail to Honduras, British Honduras, Nicaragua, Costa Rica, Colombia and Curacao.

Over the South American mainland the Pan-Grace lines, co-operating with the Pan-American, are sending Ford planes speeding across the jungles and mountains of Venezuela, Colombia, Ecuador, Peru and Chile on regular schedules!

Ford planes have proven to be most logical vehicles for these great pioneer lines that must operate over enormous distances and hazardous country with the safety and efficiency of railroads.

FORD MOTOR COMPANY

Visitors are always welcome at the Ford Airport at Detroit

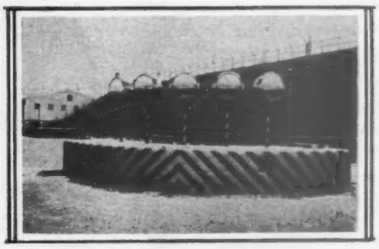


Going aboard for a long tour across tropical skies

THE GRAND CENTRAL AIR TERMINAL GLENDALE, CALIFORNIA

The Grand Central Air Terminal at Glendale, California, one of the finest airports in the country, is illuminated entirely with Crouse-Hinds lighting equipment.

In order that any airport become a factor in the rapidly increasing air traffic, it must have sufficient illumination for night flying.



The Crouse-Hinds Company manufactures a complete line of airport lighting equipment and upon receipt of detailed plans our engineers will lay out the most efficient and at the same time the most economical lighting system for your airport.

Complete information will be sent upon request.

Everything in lighting equipment for airports and airways

CROUSE-HINDS

ESTABLISHED 1897

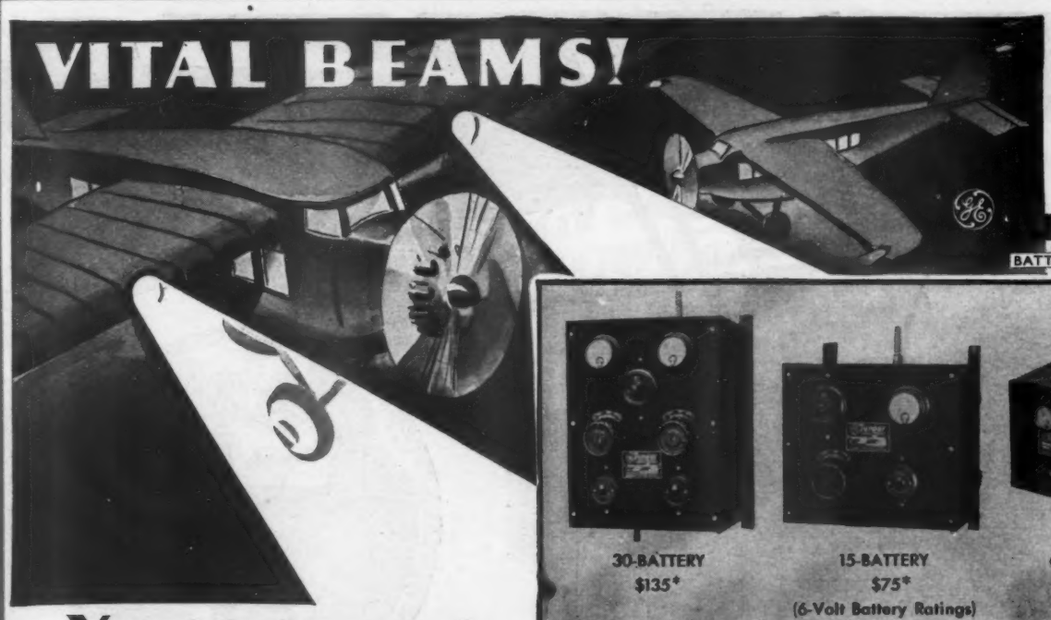
SYRACUSE, N. Y., U. S. A.

SALES OFFICES

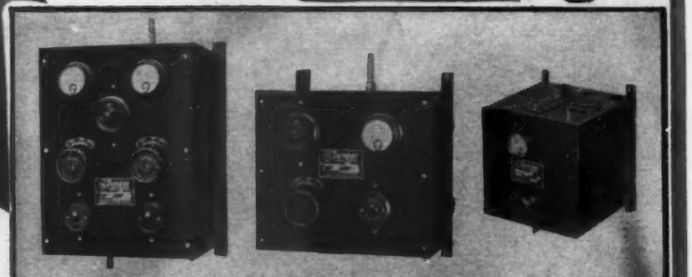
NEW YORK · PHILADELPHIA · BOSTON · DETROIT · ATLANTA · MILWAUKEE · CHICAGO · ST. LOUIS · CLEVELAND · CINCINNATI · MINNEAPOLIS · PITTSBURGH · LOS ANGELES · SAN FRANCISCO · DALLAS · SEATTLE

C-H 492

VITAL BEAMS!



ungar
BATTERY CHARGER



30-BATTERY $135*
15-BATTERY $75*
6-BATTERY $45*
(6-Volt Battery Ratings)

You can put G-E DEPENDABILITY Behind them

Big landing lights . . . little ones for navigation . . . they're important now! But how they exhaust batteries!

Recharge on the field . . . *under your own eye* . . . with TUNGAR—world's best known battery charger. TUNGAR gives you *dependable* service day or night, with least supervision and at low power cost.

It tapers the charge . . . doesn't buckle cell plates. And it's simple to use. Mount one in any shop corner, hook up batteries, set the regulator. TUNGAR does the rest. Three sizes fit every airport need.

G-E Tungar Battery Tester $39*
ACCURATE AS A WATCH!
RUGGED AS A WRENCH!

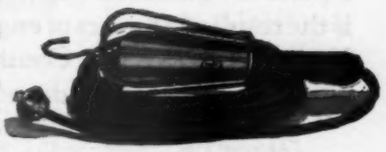
Don't Guess—
Be *Sure* of Batteries and Ship Wiring

You don't need to wonder whether a battery will do its full job. G-E TUNGAR BATTERY TESTER tells you at a glance... tests batteries *under operating load* . . . spots any kind of battery trouble.

Check over the ship with it... locate shorts, breaks or grounds quickly in any part of the low tension wiring.

This Shop Light Stands The Gaff!

Mechanics can put light *where they need it* with rugged G-E PORTABLE HAND LAMPS. They have unbreakable plugs, tough rubber cords, strong guards, husky handles and hooks. In two sizes—$3.90* and $4.50*.



*Prices net east of the Rockies

Use The Coupon

You can depend on these General Electric products. They're from the same laboratories that gave aviation the General Electric Supercharger and other electrical apparatus.

GENERAL ELECTRIC
MERCHANDISE PRODUCTS
ASK YOUR DISTRIBUTOR

Section A-191, Merchandise Dept.,
General Electric Co., Bridgeport, Conn.
Please tell me more about:

G-E Tungar Battery Charger
G-E Tungar Battery Tester
G-E Portable Hand Lamps

Name .....

Address .....

MERCHANDISE DEPARTMENT : GENERAL ELECTRIC COMPANY : BRIDGEPORT, CONNECTICUT

Dependable Continental Power in the Sky

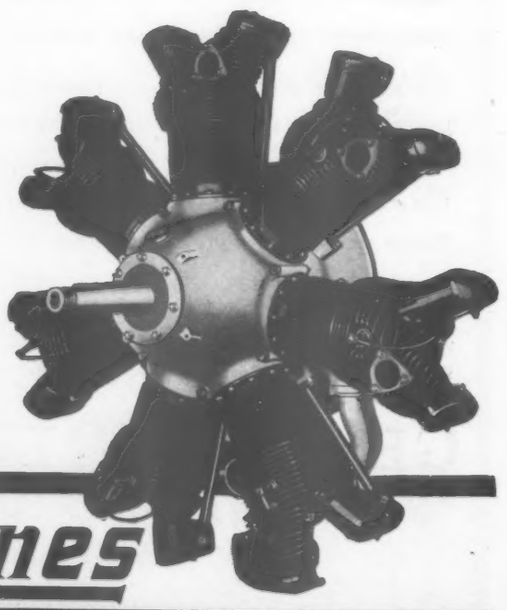
Accessory gear assembly. Keys and splines are eliminated by forging each spur gear integral with its shaft — split bearings are used. Starter gear is machined with both three jaw clutch for inertia units and internal spline for air starter drive.

A STEADY hum grows in the distance—a plane drones overhead and soon the sound trails away to a far echo. Power, speed and ease in handling all depend upon that pulsing engine. If it is a Continental Aircraft Engine, there is also a story for the pilot and passengers in its rugged sky power—the story of tough, strongly made parts fitted into an engine of moderate weight; of skill that spells quietness and the practical elimination of vibration due to a perfectly balanced engine. And of power that is the result of 28 years of engineering experience. High in the sky the Continental Aircraft Engine hums its story of dependability and power.

"Approved Type Certificate No. 32, U. S. Department of Commerce"

CONTINENTAL AIRCRAFT ENGINE CO.

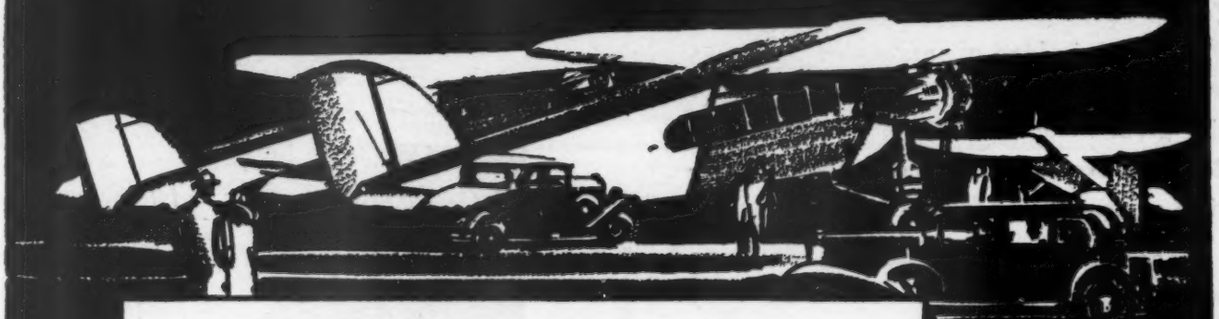
General Office and Factory: Detroit, Michigan



Continental Engines

Gulfpride Oil

AMERICA'S FINEST AVIATION OIL



GULFPRIDE OILS

provide to the highest extent these desirable features necessary for satisfactory operation of Aviation Motors.

1. **Oil economy—due to their extremely long life; resistance to oxidation and low volatility.**
2. **Lowered maintenance—because of proper lubricating qualities and very low carbon and gum forming characteristics.**
3. **Proper lubrication—a grade for each motor and condition of operation.**
4. **High quality—exhibit minimum change of body under extremes of temperature.**

GULFPRIDE OILS are approved by leading Aviation Engine Builders.

Manufactured for Aviation Engine Lubrication in five grades or body designations:

Gulfpride Oil 75 **Gulfpride Oil 120**
Gulfpride Oil 100 **Gulfpride Oil 150**
Gulfpride Oil 200

GULF REFINING COMPANY

***General Offices:* PITTSBURGH, PA.**

District Offices
BOSTON
NEW YORK
PHILADELPHIA
LOUISVILLE
ATLANTA
NEW ORLEANS
HOUSTON

•

Refineries
BAYONNE, N. J.
PHILADELPHIA, PA.
PORT ARTHUR, TEX.

GULF

Getting down to earth

Today an 18 passenger Boeing Transport Plane lands its load of nearly nine tons at 55 miles per hour on Bendix Wheels, then stops this great weight quickly and easily with its Bendix Brakes. It is a demonstration of practical engineering—practically applied.

Bendix Brakes permit holding the plane while engines are being warmed up. They eliminate the need of a ground crew, provide maneuverability for the take-off, enable the pilot to avoid obstructions and allow small landing fields to be used.

Bendix Brakes are made for planes of all sizes and have been adopted by the leading makers of aircraft.

"Air Mail Saves Time"

BENDIX BRAKE COMPANY
SOUTH BEND, INDIANA
(Division of Bendix Aviation Corporation)

BENDIX 4 BRAKES

FOR SAFETY

Fully protected by patents and applications in U. S. and abroad

Changes?...Yes!

Progress Demands Improvements

How many times have you asked yourself the question, "Will the organization of the General Electric Supply Corporation cause any changes in my established trade relations?"

The organization of the General Electric Supply Corporation has brought seventy-nine well established sources of wholesale electrical supply under one administrative head. We believe this administrative change will be to your definite advantage, and that such a network of seventy-nine strategically located wholesale warehouses will mean many benefits to you. That belief was one of the deciding factors in the decision to organize the General Electric Supply Corporation.

Write for a copy of this catalog listing 50,000 General Electric items.

This decision was both logical and natural. For years the General Electric Company has been firmly committed to a policy of progress and improvements. All forward steps that would contribute to the prosperity of our dealers and the satisfaction of our customers have been favored. The General Electric Supply Corporation is such a development... It was organized to serve you better and we know we shall merit your confidence.

Join us in the General Electric Hour, broadcast every Saturday at 9 p.m., Eastern Standard Time on a nation-wide N. B. C. network.

GENERAL ELECTRIC

SUPPLY CORPORATION

GENERAL OFFICES BRIDGEPORT, CONNECTICUT

THE KARI-KEEN COUPE

Years Ahead of the Times In

Appearance - Performance - Value

The Kari-Keen Coupe has been designed and engineered to meet the growing demand for a personal ship. Extraordinary stability and control under every condition makes it an ideal plane for training purposes as well. Unusual cabin room with an abundance of visibility attracts student training during the cold months.

Performance Facts

With 1000 Pound Load

Maximum Speed	105 M.P.H.
Cruising Speed	85 M.P.H.
Landing Speed	35 M. P. H.
Service Ceiling	16,000 feet
Absolute Ceiling	18,000 feet
Gasoline Consumption	4 gal. P.H.

With Full Load (1400 Lbs.)

Maximum Speed	100 M.P.H.
Cruising Speed	80 M.P.H.
Landing Speed	40 M.P.H.
Service Ceiling	10,000 feet
Absolute Ceiling	13,000 feet
Gasoline Consumption	4½ gal. P.H.

Regular Equipment

Oildraulic shock struts; Type "A" Consolidated instrument panel; Wired for Navigation Lights.

Some valuable territories are still available. Wire or write for information about our distributor franchise.

General Characteristics

Wing Span	30 feet
Chord, Center of Span	7 ft., 6 in.
Chord, Tip of Span	4 ft., 6 in.
Wing Area, including Ailerons,	150 sq. ft.
Aileron Area	16 sq. ft.
Span of Tail	9 feet
Length Overall	22 ft., 9 in.
Height Overall	7 feet
Weight, empty	883 pounds
Weight, full load	1400 pounds
Useful Load	517 pounds
Gasoline Capacity	18 gallons
Oil Capacity	2½ gallons
Design Load Factor	6.5
Power Plant	Velie M-5

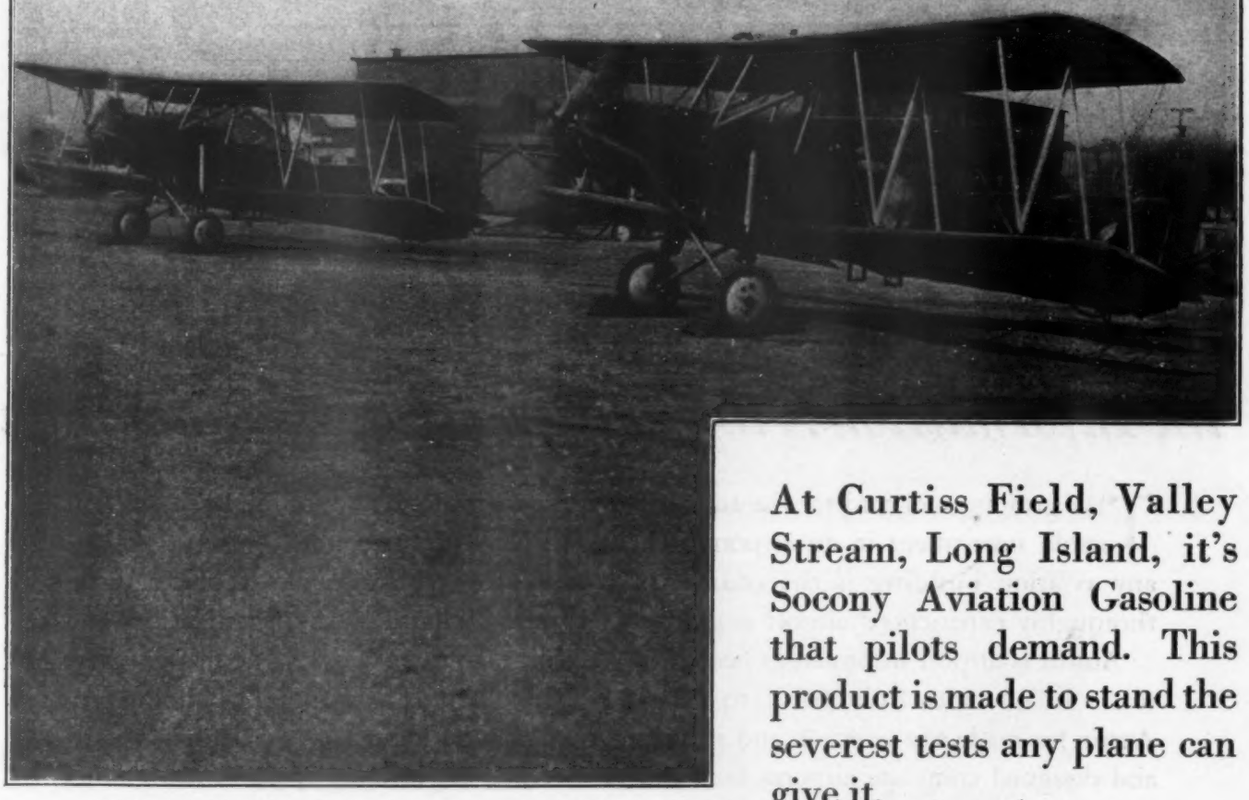
55 H.P. at 1815 R.P.M.

KARI-KEEN AIRCRAFT, Inc.

Manufacturers of Cabin Monoplanes

513 Plymouth Street **Sioux City, Iowa**

At Curtiss Field *It's Socony*



Curtiss Field at Valley Stream, L. I., showing one of the newly constructed hangars in the background.

At Curtiss Field, Valley Stream, Long Island, it's Socony Aviation Gasoline that pilots demand. This product is made to stand the severest tests any plane can give it.

You'll find Socony Aviation Gasoline and its companion product, Socony Aircraft Oil, at almost every airport in New York and New England.

SOCONY

Aviation Gasoline Aircraft Oil

STANDARD OIL COMPANY OF NEW YORK

United Airport of Boeing System at Los Angeles. Layout, design and construction by Austin.

AUSTIN HAS . . . *the Airport Experience . . . the Information . . the Nation-wide Organization*

THE greatest safeguard to wise and profitable investment in an airport or in any aviation building is the counsel of thoroughly experienced airport engineers.

Austin is airport information headquarters. In 49 cities from Coast to Coast, Austin has made site selection and surveys, and designed complete airports, both municipal and commercial . . . has designed and built hangars, depots and other buildings for many of the leading operators . . . has handled complete manufacturing plant projects for a number of the largest aircraft and parts manufacturers.

With 17 permanent district offices Austin is near at hand with organization and facilities to serve you well, no matter where your contemplated airport or building project may be located.

Good engineering is worth many times its cost. Austin Airport Engineers can give you valuable information, quickly, that will help you in planning your project right.

Just phone the nearest office, wire or write.

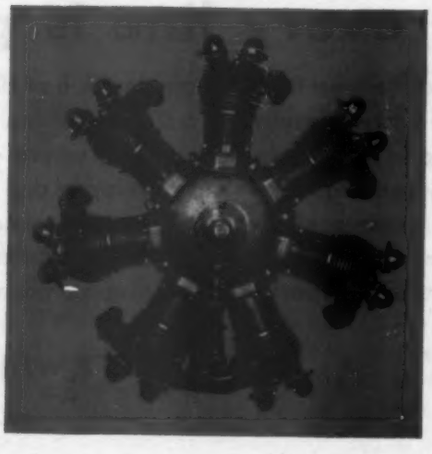
THE AUSTIN COMPANY

Airport Engineers and Builders Cleveland

New York Chicago Philadelphia Newark Detroit Cincinnati Pittsburgh St. Louis Seattle
Portland Phoenix The Austin Company of California Ltd.: Los Angeles, Oakland and San Francisco
The Austin Company of Texas: Dallas The Austin Company of Canada, Limited

Memo to The Austin Company, Cleveland— We are interested in ☐ Airport (Municipal) (Private) containing ..... acres. ☐ Hangar ..... x ..... with ..... ft. clearance. ☐ Factory approx. ..... sq. ft. Name .....
Position ..... Firm ..... City ..... A 1-11-30

▲▲▲ MILLING GEARS FROM *Alloy Steel*

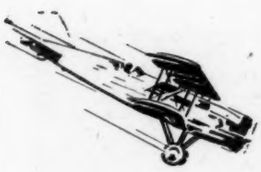


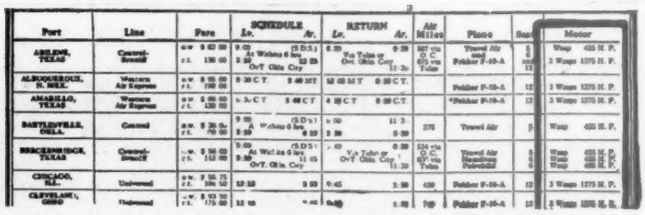
Uniform quality, extreme strength and absolute freedom from burrs or inequalities of surface is assured in every Axelson Airplane Engine gear. Carefully milled from alloy steel, each individual gear passes a series of minute inspections to keep it to the standards of quality built into all Axelson Engines and their component parts.

U. S. Department of Commerce approved type certificate, No. 16.

Axelson Aircraft Engine Co,
Factory and General Offices
Corner Randolph Street & Boyle Avenue
Los Angeles, California
(P. O. Box 337)

AXELSON AIRPLANE ENGINES





Port	Line	Fare	SCHEDULE Lv.	SCHEDULE Ar.	RETURN Lv.	RETURN Ar.	Air Miles	Plane	Seats	Motor
ABILENE, TEXAS	Central-Braniff	o-w $ 42 00 r-t. 136 00	9:05 2:30	(S.D.S.) At Wichita 6 hrs. Or T. Okla. City 52 25	8:30 Via Tulsa or Okl. Okla. City 11:30	9:30	307 via O.C. 275 via Tulsa	Travel Air and Fokker F-10-A	5 5 12	Wasp 420 H. P. 2 Wasps 1275 H. P.
ALBUQUERQUE, N. MEX.	Western Air Express	o-w $ 95 00 r-t. 190 00	8:30 C.T.	5:40 M.T.	12:45 M.T.	6:30 C.T.				
AMARILLO, TEXAS	Western Air Express	o-w $ 60 00 r-t. 120 00	9:30 C.T.	5:40 C.T.	4:30 C.T.	6:30 C.T.		*Fokker F-10-A	12	2 Wasps 1275 H. P.
BARTLESVILLE, OKLA.	Central	o-w $ 30 00 r-t. 70 00	9:05 At Wichita 6 hrs. 2:30	(S.D.S.) 5 25	9:00 11 5 2:30	5:30	275	Travel Air	5	Wasp 420 H. P.
BRECKENRIDGE, TEXAS	Central-Braniff	o-w $ 56 00 r-t. 112 00	9:05 At Wichita 6 hrs. 2:30	(S.D.S.) 11 05 Or T. Okla. City	1 05 Via Tulsa or Or T. Okla. City 11:30	6:30	324 via O.C. 275 via Tulsa	Travel Air and Fokker F-10-A	5 5 6	Wasp 420 H. P. Wasp 420 H. P. Wasp 420 H. P.
CHICAGO, ILL.	Universal	o-w $ 56 75 r-t. 104 75	12:10	3 55	9:45	1:30	430	Fokker F-10-A	12	3 Wasps 1275 H. P.
CLEVELAND, OHIO	Universal	o-w $ 83 35 r-t. 175 00	12 10	7 55	9:45	1:30	760	Fokker F-10-A	12	3 Wasps 1275 H. P.

From Kansas City
One of America's great air-centers
go 46 routes

OKLAHOMA CITY, OKLA.	Central-Braniff	o-w $ 23 00 r-t. 46 00	3:30	At Wichita 6 hrs. (S.D.S.) 7:30	7:30	11:30	205	Travel Air	5	Wasp 420 H. P.
OMAHA, NEB.	Universal	o-w $ 53 00 r-t. 43 00	10:15	12 05	1:10	2:30	165	Ryan Brougham Fokker Super Universal	4 6 6	Wasp 420 H. P. Wasp 420 H. P. Wasp 420 H. P.
PEORIA, ILL.	Universal	o-w $ 45 25 r-t. 90 25	10:30 At St. Louis 1½ hrs.	4 00	7:05 At St. Louis 2 hrs.	5:45	225	Ryan Brougham Fokker Super Universal	4 6 6	Wasp 420 H. P. Wasp 420 H. P. Wasp 420 H. P.
PONCA CITY, OKLA.	Central	o-w $ 23 00 r-t. 47 00	9:05 At Wichita 6 hrs. 2:30	(S.D.S.) 6 00	9:30	11:30	220	Travel Air	5	Wasp 420 H. P.
ST. LOUIS, MO.	Universal	o-w $ 35 00 r-t. 60 00	10:30 1 30	5 40 6 30	7:05 11:15	10:05 1:15	225	Ryan Brougham Fokker Super Universal	4 6	Wasp 420 H. P.
ST. PAUL, MINN.	Yellow Cab Airways	o-w $ 32 00 r-t. 64 00	9:00	1:30	9:40	1:30		Fairchild	6	Wasp 420 H. P.
SAN ANGELO, TEXAS	Central-Braniff	o-w $ 72 20 r-t. 145 00	9:05 At Wichita 6 hrs. 2:30 Or T. Okla. City or Tulsa	(S.D.S.) 1 30	8:00 Via Tulsa or Or T. Okla. City 11:30	6:30	660	Travel Air and Fokker F-10-A	5 5	Wasp 420 H. P. 2 Wasps 1275 H. P.
SALINA, KAN.	U. S. Airways	o-w $ 14 00 r-t. 28 00	9:00	10:35	2:45	4:35	165	Fleetwings	7	Wasp 420 H. P.
SEMINOLE, OKLA. Via S.A.F.E. Way Tulsa (S.D.S.)	Central-Braniff	o-w $ 41 00 r-t. 82 00	9:05 At Wichita 6 hrs. 2:30 Or T. Okla. City or Tulsa	(S.D.S.) 5 40 1 30	5:40 Via Tulsa (S.D.S.)	6:30	360 via O.C. 307 via Tulsa	Travel Air Brougham and Fokker F-10-A	5 5 12	Wasp 420 H. P. 2 Wasps 1275 H. P.
SPRINGFIELD, ILL.	Universal	o-w $ 45 75 r-t. 70 25	10:30 At St. Louis 1½ hrs.	5 30	6:15 At St. Louis 2 hrs.	5:45	420	Ryan Brougham Fokker Super Universal	4 6	Wasp 420 H. P.
*Subject to change without notice. For latest information call Air Travel Bureau, Allerton 5300										
SWEETWATER, TEXAS	S.A.F.E. WAY	o-w $ 60 00 r-t. 120 00	9:30	6 40	8:15	2:30		Ford All-Metal	14	3 Wasps 1275 H. P.
TOPEKA, KAN.	U. S. Airways	o-w $ 7 00 r-t. 14 00	9:00	9:40	2:20	4:30	65	Travel Air	5	Wasp 420 H. P.
TULSA, OKLA.	S.A.F.E. WAY	o-w $ 23 00 r-t. 46 00	9:30	12:05	12:30	2:30		Ford All-Metal	14	3 Wasps 1275 H. P.
TULSA, OKLA.	Central	o-w $ 30 00 r-t. 60 00	9:05 At Wichita 6 hrs. 2:30	(S.D.S.) 6 40	7:30 2:30	11:30 2:30	205	Travel Air	5	Wasp 420 H. P.
WAYNOKA, OKLA.	Transcontinental Air Transport	For Rates Call Air Travel Bureau	8:55	5:30	6:15	11:45		Ford All-Metal	16	3 Wasps 1275 H. P.
WEWOKA, OKLA. Via S.A.F.E. Way Tulsa (S.D.S.)	Central-Braniff	o-w $ 45 00 r-t. 90 00	9:05 At Wichita 6 hrs. 2:30 Or T. Okla. City or Tulsa	(S.D.S.) 7 10	9:05 At Tulsa 5½ hrs.	6:30	307 via O.C. 260 via Tulsa	Travel Air Brougham and Fokker F-10-A	5 5 12	Wasp 420 H. P. Wasp 420 H. P. 2 Wasps 1275 H. P.
WICHITA, KAN.	Transcontinental Air Transport	For Rates Call Air Travel Bureau	8:55	6:30	10:30	11:45	170	Ford All-Metal	16	3 Wasps 1275 H. P.
WICHITA, KAN.	Western Air Express	o-w $ 35 00 r-t. 60 00	9:30	10:30	9:30	6:30	170	Fokker F-10-A	12	3 Wasps 1275 H. P.
WICHITA, KAN.	Central	o-w $ 17 50 r-t. 30 00	9:05 1 05	11:05 1 05	9:30 2:30	11:30 2:30	170	Travel Air	5	Wasp 420 H. P.
WICHITA FALLS, TEXAS Via Wichita and Okla. City (S.D.S. Universal)	S.A.F.E. WAY	o-w $ 45 00 r-t. 90 00	9:30	3:30	9:45	2:30		Ford All-Metal	14	3 Wasps 1275 H. P.

And every line is powered with "Wasps"

A DAY to the west lies Los Angeles. A half day to the east—Cleveland. To Dallas in 7 hours. To Chicago in 4. Here in Kansas City, where 46 routes now converge, there has developed one of the great centers of America's new transport system—the air. A glance at the combined time-tables of these transport lines reveals a significant fact. Every single line leaving Kansas City is now using Pratt & Whitney "Wasp" engines.

Here is a tribute not only to the unusual reserve of flying power of "Wasps." It is a tribute to the care which the great transport companies are taking to insure the utmost of dependability in every ship that flies.

THE
PRATT & WHITNEY AIRCRAFT CO.
HARTFORD · · · CONNECTICUT
Division of United Aircraft & Transport Corporation

Manufactured in Canada by The Canadian Pratt & Whitney Aircraft Co., Ltd., Longueuil, Quebec; in Continental Europe by The Bavarian Motor Works, Munich

Wasp & Hornet ENGINES

AVIATION

THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

A McGRAW-HILL PUBLICATION . . . ESTABLISHED 1916

EDWARD P. WARNER. *Editor*

VOLUME 28. . . *January 11, 1930* . . NUMBER 2

Rate Regulation

AMONG the curses upon aeronautical development has been too much analogy. Superficial resemblances between aviation and some other industry or branch of transport have acted as a lure to imagine the parallels indefinitely extended. Airplanes, it was supposed, were to be sold as automobiles had been, for no apparent reason except that automobiles had been sold that way. Airships were to operate across the ocean in faithful imitation of the merchant marine. Domestic airlines in their traffic solicitation work and in their relation to the government were pictured as destined simply to repeat the experience of the railroad.

Such analogies have been bad enough when they merely led to the hasty introduction of practices in design, production, or merchandising which later proved unsound. They are worse when they cause a department of the government to get off on the wrong foot, for government moves with ponderous deliberation, and when momentum is once acquired it does not easily reverse its course.

American railroads have been subject to close regulation of their rates for approximately half a century. In that time they have had all kinds of experience. Some of the regulatory work of legislatures and commissions has been economically sound and carefully planned, calculated to protect the interest of the public without disregarding equitable treatment of the companies' stockholders.

Much of it, on the other hand, was injudicious, hasty, and altogether too likely to stifle initiative of railroad management. All, however, whether sensible or otherwise, had a real reason behind it. The railroad had received from the government certain privileges which could not be duplicated. It had acquired its right of way by eminent domain, and in some cases, as notably in Pittsburgh, a very small number of roads had been able to acquire the only topographically feasible approaches to a metropolitan district, effectively prohibiting any future entry of additional competition.

There is no such reason for regulation in the air. The operator of an airline has no natural monopoly. His highways are free to all comers.

For rate regulation of air transport in the direct public interest, to protect the traveler against extortionate charge, there is no need. Potential competition and the necessity of building up a traffic in the face of the established means of surface transport offer better assurance against excessive rates than anything that the Interstate Commerce Commission could undertake.

But there is another possible reason for some sort of control. Protection may be needed not only by the public but by the operator. He has the right, especially when he has pioneered a virgin field, to some assurance of safeguard against unfair competition. Especially has he the right to protest against wholly irresponsible competition, which manifests itself only intermittently, when there is cream to be skimmed from the market. The operator who starts when there is no traffic, who carries on until he has built it up, and who gives service twelve months in the year should be protected against the rival who comes in with minimum overhead, possibly with inadequate or unsafe ground organization, to fly only while conditions are good and to cut into the peak load.

Much as we regret any addition to the great body of governmental regulation of commerce, we are constrained to tread the path that many of the motor bus men have taken and aline ourselves among those who seek further governmental control. If air transport is to develop along sound lines, with a reasonable prospect of proper returns to those who carry the major part of the burden, there must be some restraint upon competition, at least for the next few years. We want no rate regulation, but we do want the issuance of certificates of necessity and convenience as a prerequisite before the opening of a new line. In the imposition of that additional regulatory stipulation the potential good outweighs the unmistakable features of evil.

TACOMA PUBLIC LIBRARY

Salute to the Tanager

THE GUGGENHEIM Safe Aircraft Competition reaches its end, and it must be accounted a success. The meeting of the extremely severe stipulations of the qualifying conditions by even a single machine assures that. We set a very high rating upon the importance of the event. We believe that the turn that it has given to engineering thought will have a profound significance for the development of better and genuinely safer heavier-than-air craft. The aeronautical world will watch with special interest the further evolution of the most successful of the contending types.

It is too early to appraise the significance of the competition as a whole, but it would be impossible to be too prompt in tendering congratulations to the constructors of the winning plane and expressing admiration of their design. It is a striking testimonial to the value of research and to aeronautical engineering as an exact science that it was possible to produce, largely in a laboratory, a machine which within a few weeks of its first trials was meeting all the performance requirements with almost uniform margins of safety above the required minimum. It is especially satisfying to those who believe in progress by evolution that such notable results were achieved without radical departures from standard practice. Seen from a hundred yards away and rather casually examined, neither the Tanager nor the Handley Page, which was its nearest competitor, appear in any way abnormal. Success has been achieved by good design practice, combined with mechanical invention based on laboratory study, and by a skillful blending and incorporation of all known devices that would help towards the desired end.

In warmly praising the Curtiss Company's achievement in producing the Tanager, we take special satisfaction in acclaiming Mr. Robert R. Osborn as the project engineer upon the design and as its shepherd from the first researches up through the completion of the trials. Mr. Osborn has long been known to the readers of AVIATION as the author of "Side Slips" and the faithful Boswell of the Intrepid Aviator. Although such a happy mixture of professional ability and wit is by no means without precedent in scientific history, it is none the less rare. Our readers who have chuckled over his comments upon aeronautical happenings will join us in enthusiastic felicitations to the man behind the Tanager.

In doing homage to the victor we are not overlooking the partial successes of some of the other competitors and the notable features of their designs. Honorable mention is especially due to the Handley Page entry, the only one that labored under the disadvantage of being three thousand miles from its factory. After meeting almost all the tests successfully it finally went down to disqualification upon inability to maintain the required minimum speed in glide, but it retains an important place in the history of the development of aircraft having safety of operation as a primary consideration in their design. Not so much can be said of some of the other craft that were presented for trial. A few, including certain perfectly standard commercial types, served principally to reveal either the extraordinary optimism of their backers or a genuine lack of knowledge upon their part of their own product's performance.

Although an editorial is no place for detailed technical discussion, any comment upon the contest would be wholly incomplete without some mention of the triumph won by the slotted wing. The victor and the runner-up, the only two machines to come so near to completing the trials that they were formally put through the whole series, both used the slot. Both used it as an instrument of lateral control and also for the increase of lift coefficient and the reduction of minimum speed.

The competition is at an end, but there should be no breathing space. The next step is to put the developments that it has inspired into commercial use. We shall be very much disappointed if commercial types inspired by the Tanager and its closest competitors are not promptly prepared for the market, and especially for the service of the private owner.

//

Unavoidable Accidents

TWO thousand years of progress in science and in human thought have summed themselves up in the gradually developed conviction that nothing happens without cause. Natural phenomena that the sages of ancient courts attributed to the whimsical action of gods moved by an irresponsible and sardonic humor have been traced to their proper place in an orderly cosmic scheme. Nothing happens without cause. Airplane accidents are no exception to the rule.

The term "unavoidable accident" is one that we should shun as one of the personal devils of aeronautical development. There is no such thing. No accident happens without a reason, and where reason exists avoidance would always have been possible by its removal. Always there is some defect in the machine, the man, or the surrounding conditions which could have been overcome if it had been foreseen.

Not for a moment, alas, do we dare to suggest that all accidents are practically preventable at this time. Theoretically, every one of them is avoidable. To claim otherwise is to make an advance admission of impotence. But human wit is feeble, foresight is dim, scientific knowledge is even yet infinitely incomplete. We can see afterwards how we might have avoided trouble, given enough information at the time, but it is too much to expect that we should invariably foresee. Accidents may happen with no one in any sense to blame. If the same mishap occurs a second time it is more difficult to explain. If lightning strikes still again in the same place, excepting only those cases where the primary

cause of the trouble lies in the working of natural forces for which research has as yet provided neither complete explanation nor means of forecasting, the recurrence is not only avoidable but inexcusable.

It may not even be practically possible, in many instances, to discover the cause of tragedy. There are catastrophes which will go unexplained to the end of time, but we must not be content to make additions to their number. Not only are accidents not "unavoidable," they are not even, strictly speaking, unaccountable. The cause is there, if only we can set upon its trail men clever enough to hunt it out.

> "The fault is not in the stars, dear Brutus,
> But in ourselves that we are underlings."

One of the great perils that confronts the aircraft industry is the adoption of a philosophy of resignation. No one claims that present-day flight performances are good enough or that the effort to improve them should be abandoned, but the subject of accidents is an unpleasant one and there are some who would prefer to avoid it by suggesting that all is now well or that there is no reason to anticipate the possibility of further marked advances in safety. Against that thesis this magazine rises up in arms. It will not do.

The effect of our own mental attitude upon our own labors is vital. The effect upon the general public is quite as much so. When the layman hears talk of "unavoidable accidents" his gradually growing confidence withers at the root. The teetotal expunging of that phrase from the language will be the symptom of a very healthy trend in the aeronautical community's psychology.

//

Faithfulness in Little Things

A SENSE of proportion is a valuable possession, but it sometimes proves misleading. An enterprise which must deal with the public sometimes finds its clientele perversely indifferent to the big and the important things, scrupulously intent upon the trivial ones. We know a subway system which stirred up for itself a large amount of negative good will on the debit side of the ledger by using a turnstile which had an irritating way of swinging around and swatting the passenger as he went through. We recall a railroad which gave excellent service, accident-free and true to schedule, but against which a considerable group of its passengers started a holy war because of the uncomfortable curve in the backs of the seats in the coaches.

Air lines are still in a relatively primitive state of development. It is natural that attention should have been concentrated upon operation. Only very recently has there been time to spare for the amenities. Even now they generally receive less attention than they deserve. What air transport needs is more traffic. We cannot make that declaration too often, or phrase it in terms as strong as it deserves. Passengers are not to be attracted solely by performance, nor even by performance and safety. An extra fifteen miles an hour may easily mean less in dollars at the ticket office than a little improvement in seating arrangement or ventilation, or in the attractiveness of passenger terminals, or in the convenience and cleanliness of lavatories. There have been great improvements in such matters in the last year, but even very recently we have seen instances of shocking neglect.

The tendency towards the employment by transport lines of specialists in passenger comfort and in the provision of the little frills and fancies that make for a pleasant recollection of the trip is all to the good. In carrying it further, it should be remembered that the point of view to be taken is that of the passenger completely inexpert in aeronautical law. Most of the officials of an air transport company cannot know too much about flying, in theory and in practice. Every bit of information that they acquire increases their usefulness. But there should be a few whose value depends upon their knowing very little of that subject, and upon their being able to preserve the mental attitude of the novice. It does not interest the passenger that the things he wants in a machine are aerodynamically unsound or that they would add an unjustifiable amount of weight. He knows only that he wants them. If he cannot have them, it makes no particular difference to him what the reason may be. There should be a department in the organization which is charged with interpreting the passengers' wishes in terms of an ideal. Someone else may then have to decide that the ideal cannot be realized, but the specifications should be written without any of the inhibitions imposed by a special or technical knowledge which the average traveler will not possess.

Attention to insignificant detail does not concern itself exclusively with passenger comfort. It enters into the work of the airplane designer, and the improvements in performance in the last six years have been largely due to a progressive cleaning up of details too trivial to have received attention before. It enters into safety work, and we must guard against watching the big and dramatic factors of hazard with such intentness that we neglect the little things that decide whether or not an accident is serious. The angle at which a landing gear strut is attached, the way in which a cabin door is fixed in its frame, the anchorage of the safety belt (or the provision of any safety belt at all in the case of the big cabin machines), the padding around the cockpit coaming,— such things have saved many a life. Neglected or slurred over in favor of matters of "more importance," they have been responsible for many a death or serious injury.

Eternal vigilance is the price of safety. It is the price of public popularity. It is the price of financial success. It must not be fixed upon one or two or a dozen supposedly critical points, but must cover the whole horizon in a ceaseless watch for imperfection.

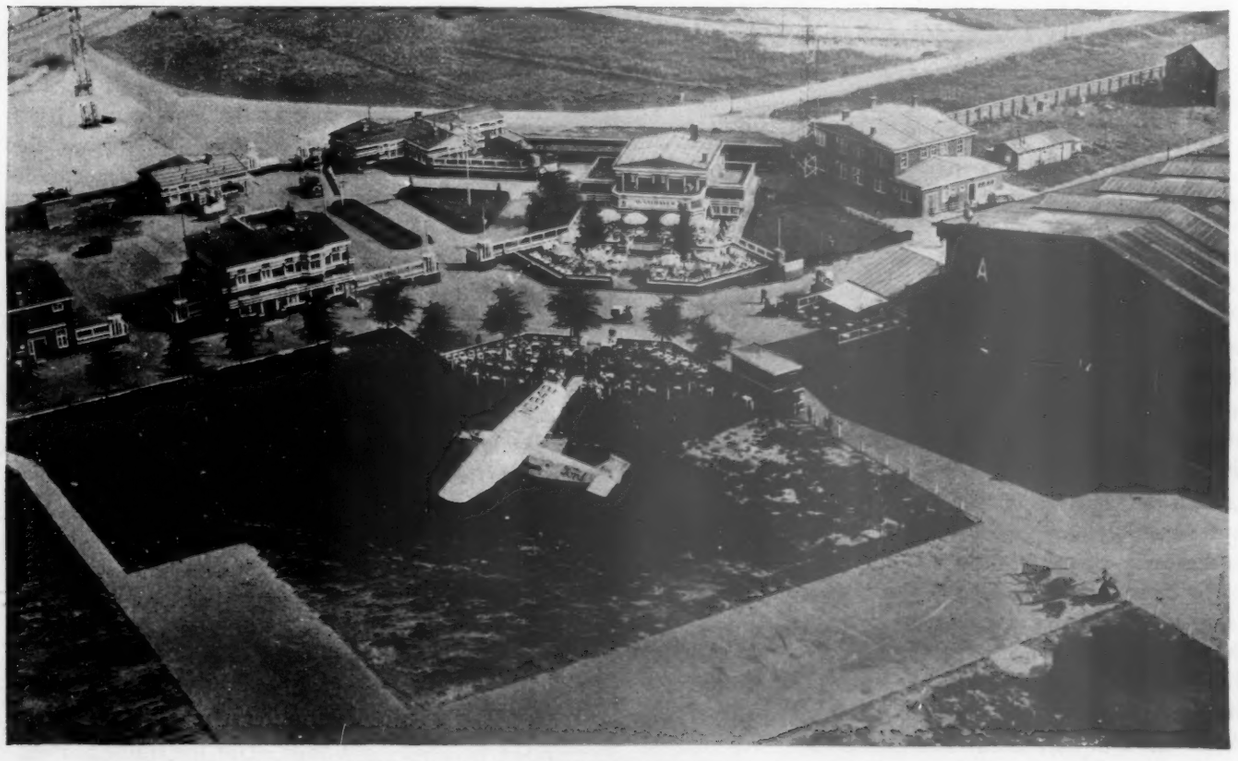
European Aeronautics AND *AMERICAN Sales*

As Related to
JOHN T. NEVILL
Detroit Editor of AVIATION
by
LEROY MANNING
Chief Pilot, Airplane Division, Ford Motor Company

A NUMBER of American government and private business officials—experts at the promotion of trade relations between the United States and foreign countries—are continually pointing out to America's industries the importance of developing export trade. Again and again they have outlined the numerous and more or less obvious advantages of increasing the distribution of American-made products in other lands.

In the aircraft industry, fortunately, that counsel has not fallen upon unmindful ears. Having reached a point where domestic consumption alone is no longer taxing production capacity, American aircraft manufacturers and their kindred concerns are day by day devoting more time to building up markets beyond our own political borders. For several years, in fact, a paltry few members of the industry have been shipping an equally few units of their respective production across the international boundaries. But much of this business has been merely a matter of "order-taking" as a result of individual aerial exploits, rather than sheer salesmanship in the countries taking delivery on such units.

The individual exploits, such as those of 1927, have



The Wasp powered Ford transport used by Mr. Manning on his European tour at Waalhaven Airport, Rotterdam.

FOREIGN POSSIBILITIES

With European countries setting up their own particular airworthiness requirements, the task of American manufacturers invading foreign markets is made thai much more difficult. There does exist, however, a profitable market on the other side of the Atlantic. It is there to be developed, and it would be well worthwhile if American manufacturers gave serious regard to that fact. Leroy Manning has recently completed a most extensive sales and demonstration tour through Europe in a stock model Wasp equipped Ford transport. His observations and opinions as set forth in this article are worthy of notice and should be thoroughly digested by all who have hopes of profits from foreign markets.

planted the seed of American trade in the foreign mind. But the flights of Lindbergh, Chamberlain, Schlee and Brock, Byrd, Goebel and others have served their principal purpose, commercialy speaking, and little more can be expected of them. Figuratively, the salesman's calling-card has been returned with a favorable message. Now it is up to the salesman to walk in and sell his merchandise.

In the rather limited experience record already written the Dominion of Canada and Newfoundland have been shown to be our best markets for aircraft and aircraft engine exports. During the years 1925, 1926, 1927 and 1928 Canada and Newfoundland purchased $2,017,659 of the $7,125,267 in airplanes and engines exported during those years. Europe was our second best customer, taking $1,880,497 of the total, and South America was third best, with $1,661,742. The figures for 1929 will show Mexico and Central America as our best patron, and South America our second best, with Europe and Canada trailing far behind.

FROM AN initial cost standpoint the development of a foreign market is usually a costly undertaking. Hence it has remained for some of our most financially resourceful manufacturers to take steps to check the sharp decline they see in the European and Canadian markets. The Canadian decline is not nearly so discomforting as statistical figures would indicate, because of the establishment in the Dominion of airplane factories operating subsidiary to American concerns.

Because of the peculiar nature of the development of so-called "commercial aviation" in Europe and because of the many political restrictions there, that region of the world presents a most annoying situation to American manufacturers who see in Europe a prospective market for large amounts of American-made aeronautical products. How these annoying elements can best be overcome will remain for time to tell. Perhaps it will be found economic, ultimately, to forget exports, in the strict meaning of the word, and sell American planes in Europe via channels now employed in Canada. Meanwhile, however, at least one American airplane manufacturer has made a strong bid for European business by the straight-from-the-shoulder method of sending one of his products on a demonstration tour of England and the Continent. We refer to the highly profitable flight recently completed by Leroy Manning and J. Parker Van Zandt in a stock model 5-AT Ford monoplane.

Mr. Manning, chief pilot, Airplane Division, Ford Motor Company, and operations manager of the Ford airlines, returned to Detroit without his demonstrator He had sold and delivered it in Prague, Czecho-Slovakia, where it will be used on the airline between Prague and Bucharest, Roumania. Since his return, and as a direct result of the tour, another Ford product has been shipped to Madrid, Spain, and the company, Mr. Manning says, is now negotiating with a number of prospects whose interest was aroused by the European flight.

Mr. Manning was asked for details of the demonstration trip and here is his reply:

"By way of answering your question, What has Europe to offer in the way of a market for American airplanes?, let me tell you something about our demonstration tour. Our plane, a stock Ford monoplane, equipped with three Pratt and Whitney Wasp engines, had been exhibited at the Olympia show in London from July 16 to 23. In spite of the European reputation for building large passenger carrying craft our plane was the largest actually exhibited in the London show in complete form.

"On August 3 we started from Croydon on a tour that was to take us over approximately 9,000 miles of European airways, to about 40 cities in 21 different countries, including the major capitals of the Continent. During the three months of the tour we carried approximately 3,750 passengers, a majority of them being European aeronautical executives and pilots; this over and above the hours accumulated in flying the route. We permitted many of the pilots to take the controls and fly the

plane themselves, thereby giving them a taste of the maneuverability of our plane and, at the same time, building up their goodwill.

"Our route took us first to Paris, then to Cologne, and Berlin, Germany. After Berlin came the following cities in the order named: Danzig, Konigsberg, Riga, Smolensk, Moscow, Warsaw, Posen, back to Berlin, Dessau, Travemuunde, Copenhagen, Malmo, Hamburg, Rotterdam, Amsterdam, Calshot, back to London, Manchester, again back to London, Brussels, Antwerp, back to Paris, Geneva, Zurich, Friedrichshafen, Munich, Prague, Vienna, Budapest, Belgrade, Bukarest, Constantinople, Sofia, Saloniki, Athens, Brindisi, Naples, Rome, Venice, Milan, back to Munich, and then to the termination at Prague. During all this flying we carried only a small amount of spare parts. Even this was needless as we experienced no trouble with either engines or plane. That fact, alone, was convincing proof of the reliability of American-made airplanes.

"That the European people are intensely interested in what we here in the United States are doing in the way of aeronautics was best demonstrated by the crowds that came to the various airports to inspect our plane. Of course, we advertised our scheduled arrival and advertised during our stay in each city, but, even so, I cannot imagine any stock model, non-historic, European airplane drawing a similar crowd anywhere in this country.

"THEY SIMPLY REFUSED to believe that it was a stock model job. Even the newspapers declared, with considerable emphasis, that it was an especially built plane, and equipped with a lot of 'extras' for display in the London show. They were amazed, also, when told that our wheel brakes, our inertia engine starters, and our tail-wheel were standard equipment on every plane turned out by our factory. The ground maneuverability afforded by our wheel brakes and our tail-wheel, incidentally, furnished us with a lot of amusement. At nearly every airport on which we landed a group of mechanics and airport attendants would come out to help us turn the plane toward the proper direction. When we locked a wheel and whirled the big craft around within its own dimensions they were astounded.

"Bearing in mind all that we read about Europe's huge transport planes, its marvelous airways and airlines, its governmental subsidy, its factories and its research work, it is difficult to believe that the average European mind would express anything but polite indifference to our best efforts. Five years ago Europe had her passenger airlines operating on regular schedule, and we had nothing except one government operated air mail line. Today, despite our late start, our air transport operators have flown approximately 16,000,000 miles, one third again as much as the combined air transport mileage of Germany, England and France during 1928. Since 1920 Germany, France and Great Britain have been ironing the "bugs" out of their equipment and their air transport service.

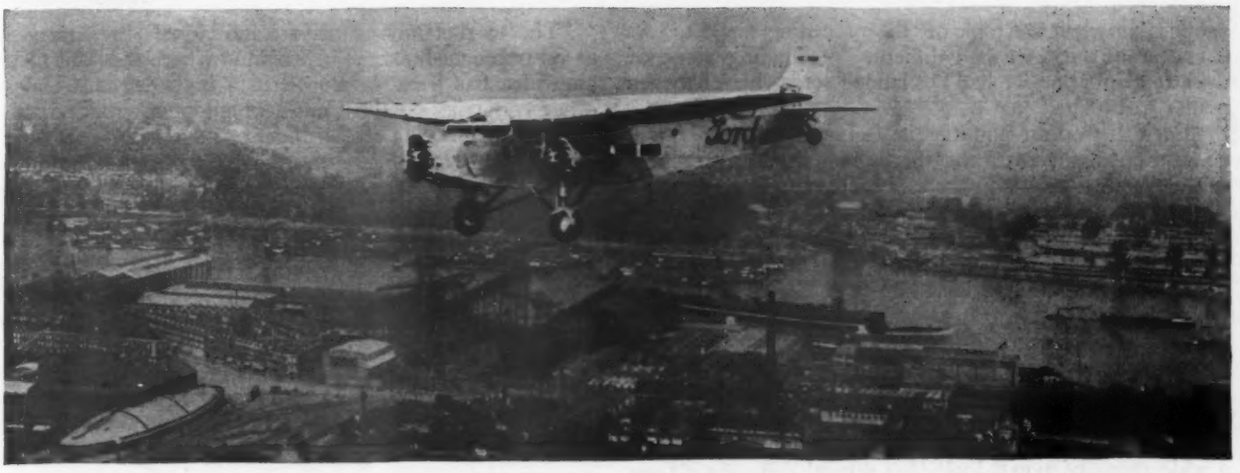
"More recently Belgium, Denmark, Czecho-Slovakia, Finland, Italy, The Netherlands, Poland, Russia and Sweden entered the transport business. Their increased experience, naturally, has permitted them to perfect a very satisfying system of public service. The attention they give to detail, to the everyday comforts and conveniences of the air traveler, is impressive to say the least.

YET, they seem to have developed that one fine point somewhat at the expense of other important factors in successful air transport. I mean by that that their equipment has not kept pace with the type of service they render. I did not observe a single airline in Europe with anything like the modern, reliable, and efficient equipment in daily use on any of the airlines in this country. And that fact, mind you, has helped to create the market about which we are talking.

"We speak of European 'commercial aviation,' although, in reality there is no such thing. Every operator in Europe is subsidized by some government, as you know, and some of the subsidies are as high as $2.04 per mile. That is a higher rate of subsidy than it costs us to operate our planes. And still they are making no profits. That does not speak well for the efficiency of their planes, yet that seems to be the only answer to the enigma. The French government in 1928 spent $4,480,000 in air transport subsidies, alone, not to mention $8,510,000 donated toward the promotion of civil aviation and $32,280,000 toward furtherance of military and naval aeronautics. Great Britain appropriated $1,119,000 to air transport companies, $2,020,000 to civil aeronautic interests $77,000,000 to military aviation, and $77,800 to private flying clubs. This country, as you also know, has no direct subsidy at all, the closeest approach to subsidy being our well equipped airways, the service rendered us free of charge by the Department of Commerce, the lessons we may learn from the various military and naval experiments and the equipment our government purchases from us.

"Other than Germany, which country, of course, is

Officials of the Junkers factory meet the touring transport at Dessau



Above: Flight picture of the tri-engined Ford over Germany during the recent sales tour of Europe. Below; Another air view of the transport over Rottendam, Holland.

restricted to commercial development, the governments of Europe are chiefly concerned with the promotion of military aeronautics. That is one big reason they are generous in their support of development along so-called civil lines. But they have never made a serious attempt to master the trick of mass production. When we told them that complete tri-motored Ford monoplanes almost identical with the one they were looking at were rolled out of our Detroit factory three or four times every five-day week they simply could not believe it. Of course, that really is not mass production as we speak of mass production in this country, but it was enough for our European friends to wonder at, none-the-less.

"In Europe they do much of their work by hand, consequently their production is very low. That helps to bring the cost of their airplanes up, which is another reason we have a market in Europe. American manufacturers, with anything approaching a fair production, can well underbid any manufacturer in Europe, and still make a profit. To cite an example in our own class, there is a foreign all metal transport equipped with three engines of around 400 hp. and widely used on German lines. Its performance is inferior to ours, and the plane sells at about $98,000, or more than $40,000 in excess of what we get for our costliest stock job.

"Speaking of performance, might I say that we were laughed at when answering questions relative to what our plane could do? They did not believe us and made no 'bones' about letting us know they didn't. Now, that doesn't sound reasonable in what belittlers of our own country's accomplishments call 'air-travelled Europe,' does it? Yet, that is what happened. So we proved our claims. An official of the Czecho-Slovakian airlines, the purchasers of our demonstrator, asked us how quickly our plane would climb to the first thousand meter elevation carrying full passenger load. We told him it would do it in 4 minutes.

"Impossible"! he exclaimed, shrugging his shoulders, as if we had under-estimated his intelligence.

" 'Watch us prove it,' we said, and proceeded to do so. In fact, the plane's climb bettered 4 minutes by a safe margin. When we landed he wrote out a check and instructed us to deliver the plane at end of our tour.

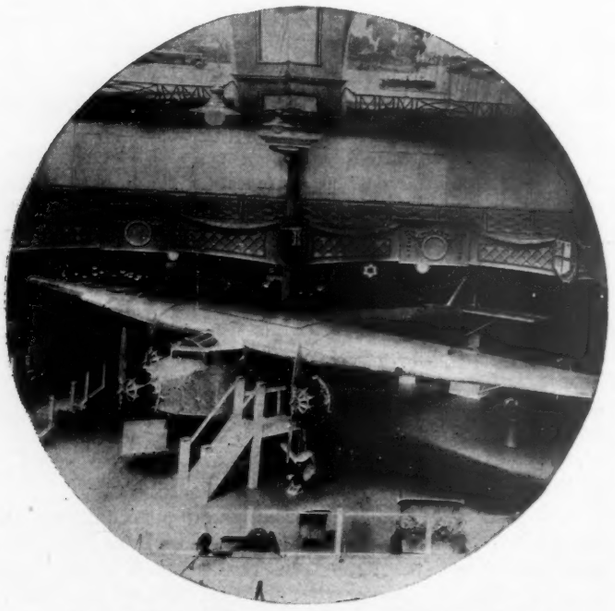
"Thus it is that Europe, generally speaking, does not seem to realize the progress we have made here in America. Europe, with her airlines and 'commercial' airplane factories 10 years old, recalls that we had nothing five years ago. She cannot believe that during those five years, we have surpassed her in many respects, chief among which respects is that we have learned to build a profit-making airplane at a profit without direct subsidy of any kind. Further than that, our commercial airplanes can out-perform theirs, and still further, we can make a profit selling our planes at prices considerable lower than theirs.

"EUROPE is producing no airplanes capable of making a profit. The planes being used on her airlines are costly, inefficient, uncomfortable, obsolescent, and produced in very small quantities. It can be said of their airlines that they maintain remarkable fidelity to schedule despite the topography and weather with which they have to contend, but they rely to a considerable degree on American patronage. Their engines use castor oil, with the result that their planes come in off a run grimy with exhaust matter, which is not a comforting sight to the fastidous air traveler. Our plane, burning mineral oil, would land on the various airports almost as shiny and

spotless as when we took off the preceding airport. As a matter of fact, we had difficulty persuading some of the attendants that we had not landed somewhere between points to brush it up.

"Each European country is following its individual conception of aircraft, and there are marked differences in the trend of design in the different countries. England has a preponderance of military craft. There they are following an interesting method of stainless steel construction. They also are devoting considerable attention to building metal flying boat hulls. In Germany the tendency is toward large heavy-duty craft—all metal tri-engined monoplanes and flying boats of unusual passenger capacity, some of them designed with an eye toward trans-oceanic service.

"France and Italy did not seem to have any particular objective in design or construction. Their planes covered a wide range of types, including several different classes



The Wasp powered Ford transport on display at the London International Aero Exhibition, July, 1929.

of construction in each type. Most of them were designed for military use, or with a view toward breaking some world record.

"ALL OF THE FOREGOING should indicate to the American manufacturer that the European market is one to woo. What I have said about our plane is similarly true, I believe, of almost any other type of American-made plane pitted against a European-made plane of its class. I have used our plane as an example of America's aeronautical superiority because that is the plane with which I am most familiar and because that is the plane with which we made the tour. It occurs to me that there should be a very definite market in Europe for the single engined cabin monoplane of the four, five or six place type. That is the type most popular in this country and a type European designers have neglected almost entirely, although DeHaviland recently brought out a four place job of that design powered by an Armstrong-Siddeley engine of 240 hp. DeHaviland, incidently, is just about the only commercial airplane manufacturer in Europe with anything approaching real quantity production.

"The market among private individuals in Europe is as yet untouched, except in England where the light plane club idea has been developed to a high degree. Unless other countries on the Continent adopt a similar policy otward encouraging establishment of such clubs, that particular market is likely to remain negligible for some time, due to the general economic condition prevailing over there.

"I SINCERELY BELIEVE that manufacturers of all-metal transports, of which there are several in this country, have the best opportunity in European export trade. Europe has established airlines and from time to time is establishing more. That means occasional new equipment for replacements and increased equipment to take care of the new lines. The numerous over-mountain and over-water routes favor the multi-engined type for safety reasons and climatic conditions practically demand all-metal construction. The extremes of climate between northern Europe and the Colonial possessions in Africa are something to wonder at. Germany and Russia are working in metal not only because of its workability and strength, but because it is the only practical substance that will stand up under their rigorous climate. In Africa, curiously enough, it isn't the terrific heat that eats away an airplane's covering so much as it is the infinitely numbered insect.

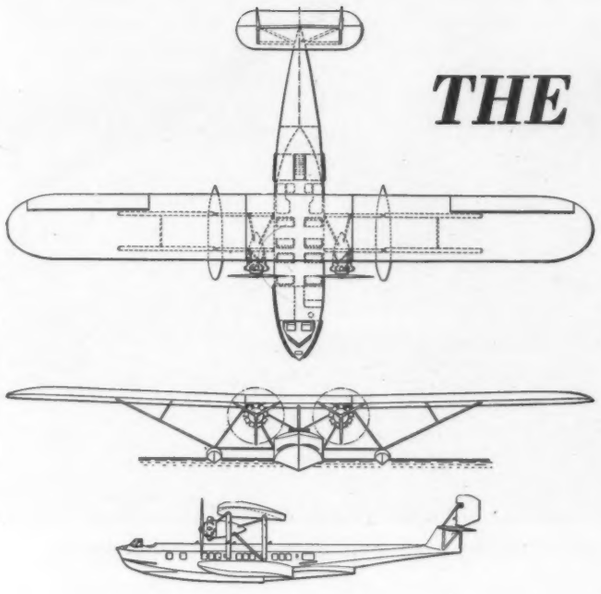
"Here in the United States we occasionally read about a hungry horse or cow nibbling a fabric covered airplane into the recovering department. In Africa, India, South America, or any other country where insects are known to be voracious, manufacturers of metal planes can well use the lowly insect as a sales argument.

"Seriously, though, the American airplane maker seeking a lucrative contact in Europe, faces a number of disheartening obstacles, chief among which is governmental subsidy. In the final analysis the governments themselves are the purchasers and, naturally enough, they do all they can to patronize the industries they help support. Even among the nations of Europe, the Continent's tangled political boundaries with attendant red-tape and endless complications has made the manufacture of aeronautical products economically unsound.

"Because of the aircraft factories in such countries as England, France, Germany and Russia, I would say that American airplane manufacturers have very little chance for exportation to those nations so long as the present subsidy system is in force. That, of course, eliminates a large portion of our prospective market until some means is found to get around this barrier to trade. Meanwhile there are many other countries in Europe, countries having no aircraft plants, that can use air transport to an economic advantage. The Ford Motor Company has delivered planes to Czechoslovakia and to Spain. Those are just two of countries to which I refer.

"Interest displayed in the accessory equipment on our plane seems to indicate that this country's aircraft accessory producers have a potential market throughout Europe. Tail-wheels, wheel brakes instruments of various kinds and ground equipment are some of the items they seemed to lack.

"Europe has many, many miles of passenger airlines and needs profit-making airplanes. We, in America, are certain we have the airplanes they need. Therefore, it is up to us to figure out some way to cultivate their business. Personally, I believe the answer lies in just such demonstration tours as that which the Ford Motor Company has completed."



THE CONSOLIDATED "Commodore" FLYING BOAT

A Description of the Commercial Adaptation of the Navy XPY-1

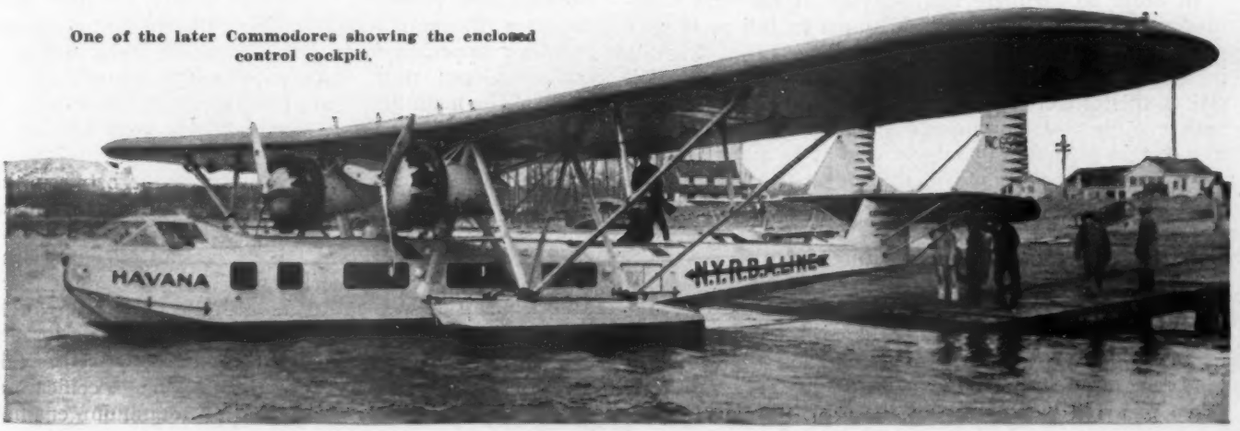
By LESLIE E. NEVILLE
Technical Editor of AVIATION

THE CONSOLIDATED COMMODORE, Model 16, largest commercial flying boat to be built in numbers in the United States, is now under production at the plant of the Consolidated Aircraft Corporation, Buffalo, N. Y. A production unit of twelve of these craft is now under way to fill an order of the New York Rio and Buenos Aires Line, Inc., which is now operating on regular schedule between South American ports and is planning to extend its service to New York. Several of the Commodores have been delivered and are now in South American service.

The Commodore is a central hull, monoplane flying boat powered with two Pratt & Whitney Hornet engines rated 575 hp. at 1,950 r.p.m. The craft has a wing span of 100 ft., a length of 61 ft. 9 in. and a height on handling gear of 16 ft. Its weight empty is 9,785 lb. and its gross weight 17,600 lb.

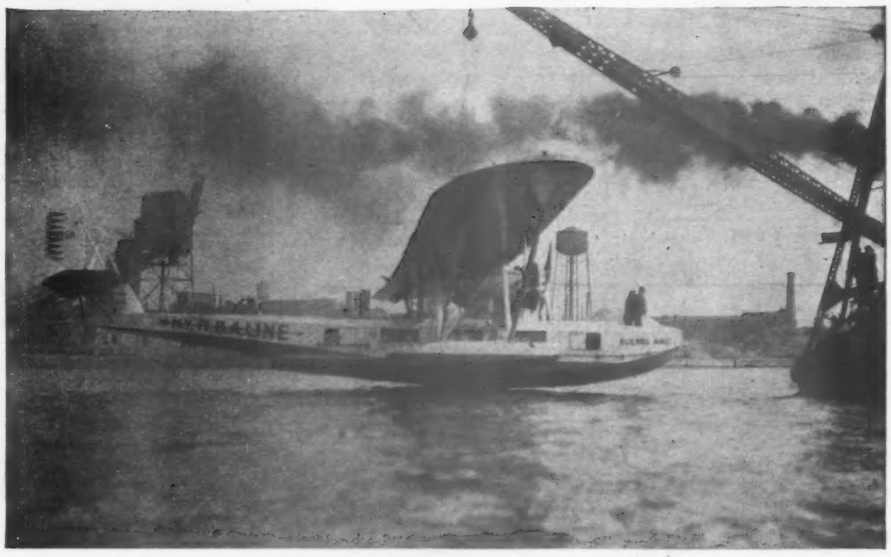
IN DESIGN the Commodore is the commercial adaptation of the XPY-1 Navy patrol boat built by Consolidated under a contract awarded as a result of a design competition. It was designed by I. M. Laddon, assisted by Frederic Flader and J. L. McClane. Hull lines were developed for the original flying boat by Captain Holden C. Richardson of the Bureau of Aeronautics, Navy Department.

Wind tunnel tests of a model of the consolidated XPY-1 showed a maximum L/D ratio of 11.4. The



One of the later Commodores showing the enclosed control cockpit.

advisability of moving the engines to a point above the wing was considered at this time and the model was modified with this idea in mind. Tests of the modified model showed that the maximum L/D value was reduced to 7.5 by this change and the drag at all angles of attack was increased to a prohibitive extent. The L/D ratio of the original model is attributed to the high aspect ratio (8.9) monoplane wing and to the general cleanness of design. Placing the power plants above the wing was abandoned also because it was believed that it would result in an increased landing speed due to the fact that the propeller disk areas would block off a relatively important percentage of the air reaching the wing when the engines were throttled.



A photograph taken during the launching of the first of the Commodores in Buffalo

Model basin tests of the Admiral or XPY-1 indicate a peak requiring maximum power at 33 per cent of the getaway speed or approximately 20 mi. per hour. In actual tests this peak is not apparent, acceleration being uniform and rapid until take off. With a gross weight of 13,600 lb. the XPY-1 takes off in 31 sec. in still air and under the same conditions with the gross weight increased to 16,000 lb. the craft requires 45 sec. to take off. Commodore performance is on this basis.

Practically all of the aerodynamic features of the XPY-1 are retained in the Commodore, the modifications being mainly structural. A crown deck has been substituted for the cylindrical deck of the patrol boat to provide additional headroom for passengers and sufficient height for the possible installation of sleeping berths.

The monoplane wing is of constant chord, this value being 11 ft. 6 in. throughout the span. A Gottingen 398 airfoil section is employed, affording a good combination of maximum L/D ratio and spar depth for such a long span. Ailerons are of a balanced type and have a total area aft of the hinge of 110 sq.ft. The 1,110 sq.ft. of wing area is so distributed that 207 sq.ft. constitute the center section and the remainder the two wing panels. The angle of incidence is + 4 deg., while the dihedral angle is 2 deg.

In order to facilitate manufacture of the first Commodore the hull lines were laid down to full scale on a smoothly finished floor board 75 ft. long and 25 ft. wide in the engineering department. From this layout, full size templates were made of all of the necessary sections and sent directly into the shop for use. This practice has certain obvious advantages and it is apparently an adaptation of the "mould loft" used in the construction work of ship building firms.

PROBABLY the outstanding features in the construction of the Commodore are the extensive use of forgings and the open sections used in the structure, the advantages of open section construction being accessibility of members for riveting and elimination of the possibility of internal corrosion. Particular care has been taken to avoid hammering of the skin, the only important irregular shape being found at the nose. Forming of this member is done on a Pettingill No. 2 hammering machine. Small parts are hand hammered. It is noteworthy that a maximum of athwart-ship bracing is employed in the structure and a large proportion of the weight of the floor system is carried by longitudinal members which also contribute to the general strength of the hull.

WITH THE EXCEPTION of the fabric covering the wing of the Commodore is built entirely of metal, Aluminum Company of America designation 17ST alloy being used. Spars are of the Warren truss type having extruded bulb T sections for the flanges and back to back channels for the web members. These members are separated at the center by spacers. The flanges both top and bottom are joined by lighter aluminum alloy extruded trusses which act as drag truss compression members. Double drag bracing is used with one pair of wires in the plane of the upper flange and one in the plane of the lower. The T section flanges are finished with a cover plate of extruded aluminum alloy.

Ribs are also of Warren truss type formed from strip stock rolled to channel section. Connection between the flange and web members is made by means of a small + shaped aluminum alloy forging, fitting inside of the channels and providing anchorage points for four 1-in. diameter through rivets. The ribs thus constructed weighing approximately 2 lb. each and under low and high incidence static tests withstood substantial overloads. The main beams are built up on jigs by means of squeeze riveting. Hand squeezers are used whenever possible in final assembly.

One fuel tank, 315 gal. capacity, is set between the spars in each of two compartments of the center section. Oil tanks, each having 25 gal. capacity, are placed in each end of this section. The drag truss is made up of top and bottom chord members of extruded bulb T section, while the web members are extruded bulb angle sections in Warren truss form. Center section ribs are standard. This structure is protected by red oxide and zinc chromate of Navy department specification, while the final finish is lacquer or aluminum enamel.

Fittings are of chrome molybdenum steel and all sheet metal of this specification used in fittings is heat treated to 125,000 lb. per sq.in. TS after welding. Following the heat treating cadmium plating is applied.

External bracing of the wings consists of streamline aluminum alloy tubing. The forward outboard strut is drawn from a 5 in. OD aluminum alloy tube of 0.134 in. gauge material. It is said to be the largest member of this type thus far used in aircraft production. Two other special sizes of streamline tubing are employed, both being drawn from 4 in. OD aluminum alloy tube of 0.148 and 0.09 in. gauge respectively. In addition to these three sizes, two Aluminum Company standard sizes of streamline tubing are used.

THE HULL, under present production methods, is built in inverted form. Bulkheads are set in place in jigs and all of the structural members of the bottom are put in place in this position. After the bottom plating has been applied, the hull is turned to normal position and the sides and upper structural members are added. This is followed by the application of the plating for the sides and the top. Bulkheads of 0.030 plate are provided at appropriate intervals, the sheet material being bordered by extruded bulb angle section aluminum alloy. Extruded longitudinal stringers of bulb angle section are riveted to the deck and bottom plating on approximately 7-in. centers throughout the deck area and much closer than this along the bottom. These longitudinal stringers are supported in turn by intermediate floor frames built up of extruded angle and channel section members in the form of a truss. These floor frames are supported at five points, the two chines, the two keelson plate girders and the central keel truss. The hull analysis was made in accordance with naval architectural methods basing external loads on three criteria:

1—Hogging condition with the crest of the wave amidships.
2—Sagging condition with the trough of the wave amidships.
3—Landing condition with the load concentrated on the bottom forward of the step.

These were the determining factors in the thickness of plating, spacing of longitudinal stringers, design of the floor frame trusses, the keelsons and the central keel truss.

In the forward portion of the hull there are four floor frames between each set of bulkheads. These floor frames are formed and assembled in jigs. They are made up of extruded bulb angle section members with two main trusses at the bottom. Plate girders are set 11 in. on each side of the center. The skin or plating is applied with splices staggered and is made water tight by the application of cotton tape, soap and soya bean compound.

In the process of fabrication the skin is held in place by small L-hooks and wedge shape blocks, making it possible to drill the plating and structural members at the same time. The blocks are easily removable for riveting the skin to the structure. Following the completion of the bottom plating the completed hull is turned over as previously mentioned and at this point it is filled with water approximately to the lower chine as a test for water tightness.

The watertight splices in the plating are made up of a double row of staggered rivets. All contacting surfaces are coated with varnish and assembled while the varnish is still wet.

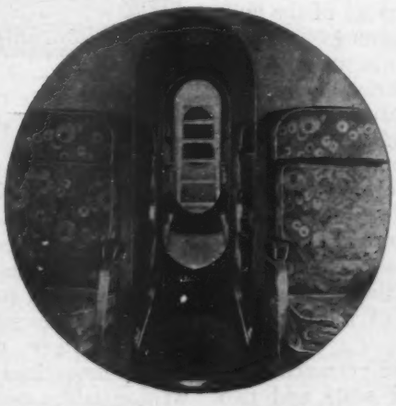
No break is made in the structure to provide for the step, this unit being built up by a V-shaped form piece, while the keelson girders and chine members are carried through. The stringers are built down to form the step.

Diagonal members run from top to bottom of the main bulkhead and connect with fittings at the attachment points of the structure. They are reinforced by steel fittings riveted within the skin and are double or single angle members, depending on the stresses to which they are subjected.

Formed members of bulkheads and belt frames are cold worked and in heat treated condition.

THROUGHOUT THE CONSTRUCTION section sizes have been standardized to as high a degree as practicable, the result being that stock sizes are relatively few in number.

In addition to the five sizes of streamline tubing previously mentioned, two sizes of extruded bulb T section material are used in the wing structure. These are $2\frac{3}{8}$x$1\frac{1}{2}$x$\frac{3}{16}$ in. and $2\frac{1}{4}$x$1\frac{1}{2}$x$\frac{1}{8}$ in. Two sizes of plain angles, $\frac{3}{4}$x$\frac{3}{4}$x$\frac{3}{32}$ in. and 1x1x$\frac{3}{32}$ in., three sizes of bulb angle section material, $\frac{7}{8}$x$\frac{9}{16}$, 1x$\frac{1}{16}$, and $1\frac{5}{16}$x$\frac{3}{4}$, are used. The channel sections are three in number, $\frac{7}{8}$x$\frac{3}{8}$x$\frac{1}{16}$ in., $\frac{7}{8}$x$\frac{3}{8}$x$\frac{3}{32}$ in. and 1x$\frac{1}{2}$x$\frac{3}{32}$ in. Two 1x1 plain angles formed by extrusion are used for the after part of the keel and two extruded plain angles are employed for the floats. The top and side plating of the hull is 0.030 sheet, while the bottom plating forward of the step is 0.064 and aft of the step is 0.040. Two sizes of rivets are used in the hull; $\frac{1}{8}$ in. in sides and top plating and $\frac{5}{16}$ in. in bottom



Left: One of the day bed cabins. Center: View through the central passage. Right: Seats in the forward compartments.

plating. Riveting is relatively easy on account of the open section material employed. Forgings are used for strut ends at the points of wing attachment.

The mooring pendant is $\frac{9}{16}$ in. diameter bronze cable attached to the keel at bulkhead No. 2, and the anchor cable, which is 150 ft. in length, is $\frac{5}{16}$ in. diameter bronze and is equipped with fittings at 25 ft. intervals by which the pendant can be attached. A cork canvas covered bumping pad is rigidly attached to the nose.

STABILIZING FLOATS, whose center lines are located about 14 ft. from that of the hull, are structurally similar to the hull and each is divided into three water tight compartments by means of bulkheads. An unusual feature of these floats is that they have no drain plugs. Each compartment is fitted with a $\frac{1}{2}$ in. tube running from the bottom to a point $1\frac{1}{2}$ in. above the deck. A hose may be attached to the abutting pipes, making it possible to pump up the compartments individually.

Right and left floats are interchangeable and are attached to struts projecting from either side of the hull and also providing a point of support for the external bracing struts of the wing. Thus the flotation system is so tied into the external wing bracing that, while the overall span is large, the overhang at the wing tips is less than $1\frac{1}{2}$ chord lengths. Each float is held in place by means of eight studs and can be easily and quickly removed without disturbing the wing bracing. The ends of the projecting struts are squared to provide bearing area for the floats and squared ends are filled with cork and painted to provide water tightness.

THE CABIN is 8 ft. 5 in. wide and has 6 ft. head room. The hull is entered through a hatch in the deck and is divided into several compartments. The subdivision furthest aft, which is directly accessible by means of the companionway leading from the hatch, is devoted mainly to mail, one compartment being provided on each side of the companion ladder, and the combined capacity of the two being 125 cu.ft. Sliding hatch covers are also built into the side of the hull to facilitate loading of mail. The capacity of the two rear mail compartments is 200 cu.ft. All bulkheads aft of the entrance compartment are fitted with apertures through which it is possible to gain access to the tail post for inspection.

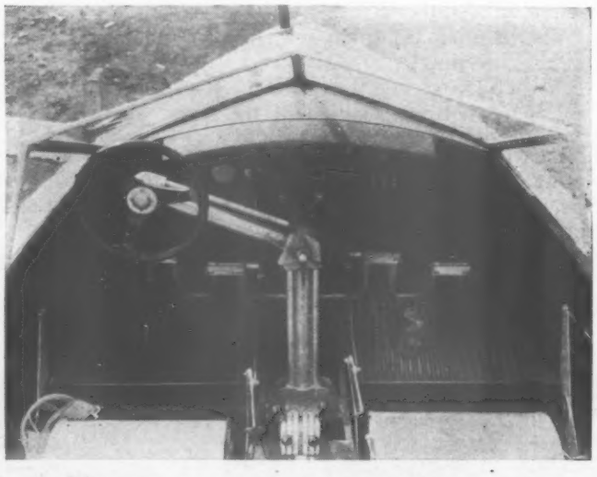
Forward of the step are three passenger compartments, each $73\frac{1}{4}$ in., providing a total capacity of twenty persons. There are three windows in the outer wall of each compartment and these windows are permanently closed. Ventilation is provided by circular openings with semi-spherical air scoops on the outer surface of the hull. Provision to vary the area of the openings is made through the use of an internally mounted metal semi-sphere controlled by a shaft having a knurled knob in the cabin. There are two inlet and two outlet openings in each compartment, two in the deck and the other two in the side plating of the hull. The ventilators for the forward portion of each compartment open toward the rear and provide suction, drawing the air from the compartment, while those at the rear open forward, furnishing an inlet for fresh air. In order to prevent drafts the main current of air passes between the skin or plating of the boat and the interior lining of the compartments.

The compartment just forward of the entrance compartment is furnished with two single seats and two daybeds, one of these being on either side of the center aisle. Forward of this compartment are two others, each of which has double seats facing each other on both sides of the aisle, providing a capacity of eight passengers per compartment. Forward of these is a division in the hull, the port side of which is devoted to a washroom and radio room, while the starboard provides an additional mail or baggage compartment of 75 cu.ft. capacity. This division is separated from the control cockpit through a water tight door which can be opened from either side.

With this interior arrangement the boat has a capacity of 20 persons. Additional passenger capacity can be provided, however, by sacrificing one or more of the mail compartments.

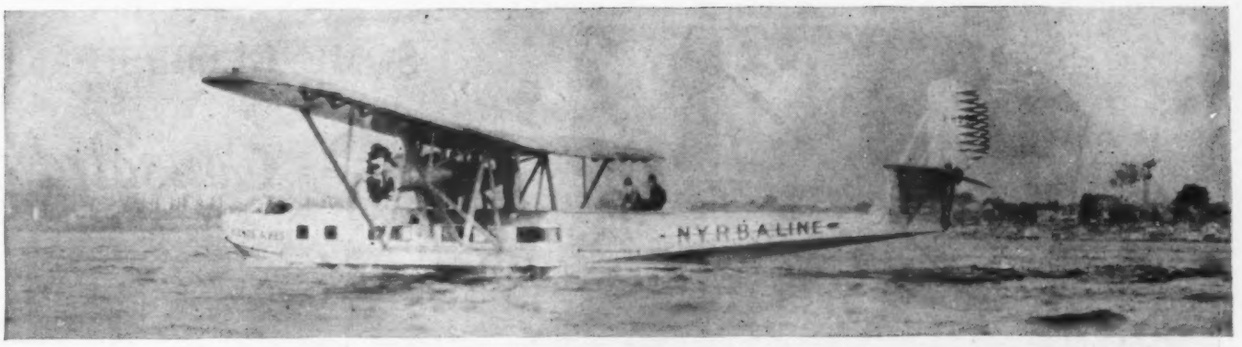
The first Commodore was outstanding in interior finish and design, the decoration being under the direction of Frederick J. Pike, a Buffalo interior decorator. A modernistic motif was developed by Mr. Pike through adaptation of the tropical colors that were to be seen along the route over which the plane is to operate. The basic tones are silver, henna and green. The inner walls, as well as the partitions, are of wallboard covered with damask, while a separate material is used in draperies with still other fabrics for upholstering of the chairs and cushions.

The walls of the salon de luxe (the compartment containing the daybeds) are covered with a Deauville rep material of pale lavender and silver, the daybeds being upholstered in turquoise damask and the seat cushions in raspberry, gold and tan stripe material. Print draperies in lemon yellow and tan have been used. In order to provide an individualistic color scheme for each cabin the central compartment has walls in green and gold with a henna color modern damask for seat cushions. The foremost cabin has chairs upholstered in a green moire, while a modernistic fabric in peach and silver is used for the cushions. Tan damask is used for the wall coverings. The central passageway through the compartments is carpeted with a jade green rug, while rugs between the seats in the cabins correspond to the color scheme of each room.



Photograph showing the open control compartment of the first commodore.

Between the seats and under the windows in each of the passenger compartments are panels for time tables, magazines or newspapers. Adjustable card or writing tables can be fitted into appropriate slots in the same manner as that employed in Pullman cars.



A photograph of the Commodore taxiing on the water during one of its trial flights.

External finish also was specially attractive in the first Commodore. A cerise wing with yellow and brown hull was chosen to harmonize best with a tropical setting.

IN THE FIRST PLANE the control cockpit was open but was later inclosed to provide protection for the pilots against weather conditions in the tropics. Both top and sides open by sliding to provide entrance to the control compartment without passing through the cabin. The pilots are seated in the bow just behind an anchor compartment in the nose which is accessible through a hatch in the deck and separated from the pilot's compartment by a bulkhead. Control is of the standard wheel and pedal type, a single swinging wheel being used. All moveable steel parts in the cockpit are made of Allegheny metal. Cables are used for the most part in the control system with a combination of these in push pull tubes being used for the ailerons. Tail surface structures are built up of extruded 17-ST spars, drag trusses and sheet duralumin ribs and are covered with fabric. An externally braced monoplane stabilizer, single unbalanced elevator and twin fins and balanced rudders above the stabilizer and elevator are employed.

The rudder travel is 30 deg. each side of neutral position, while the elevator travel is 30 deg. up and 20 deg. down. Travel of the rudder pedal is 4 in. either side of neutral, while the neutral position is 1½ in. forward of the vertical. An adjustment range of 3 in. is provided for the rudder pedal. The travel of the control column amounts to 18 in. Normal setting of the stabilizer is at 4 deg. incidence, while an adjustment range of 3 deg. up and 3 deg. down is provided.

The area of the two rudders including the balance is 40.2 sq.ft., while that of the balance on each rudder is 3.3 sq.ft. The total vertical area of the tail surfaces is 54.95 sq.ft., while the center lower fin is 14.75 sq.ft. The total horizontal area is 135.5 sq.ft., 81 sq.ft. of which constitute the stabilizer. Fin and rudder are built with a 50 per cent Gottingen section.

THE ENGINE MOUNTS are of welded steel tubing and rubber bushings are used around the engine bolts to absorb vibration. Three-blade metal propellers of approximately 9 ft. 6 in. in diameter are used on the Hornet engines and an exhaust manifold having a hot air stove and control box for interior heating purposes is also employed. Controls for the power plant, as well as the fuel system, are led through streamline fairings to the pilot's cockpit and auxiliary gasoline tanks can be installed in the hull if desirable. The port engine is provided with a 50 ampere generator which, together with an 80 ampere hour Willard storage battery, constitutes the electric generating system. The storage battery is installed in the radio compartment from which the electric system is controlled. A voltage regulator is also used in the system and is located in the radio compartment. Provision for mounting landing lights on the leading edge of the wing structure also has been made.

Each Commodore is provided with a handling truck to be used when the plane is on land for overhauling. This truck provides mounting for two 44 in. x 10 in. wheels forward and one tail wheel.

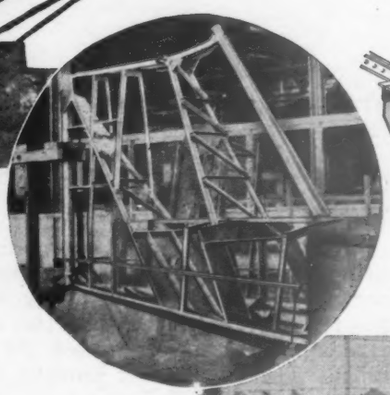
Specifications as furnished by the manufacturer are:

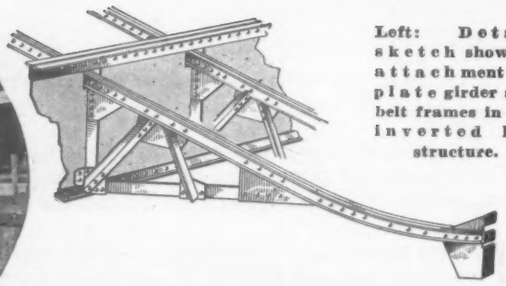
Type	Monoplane flying boat
Span	109 ft.
Overall Length	61 ft. 6 in.
Overall Height	14 ft. 2 in.
Wing Airfoil	Gottingen 398
Chord	11 ft. 6 in.
Incidence	+4 deg.
Dihedral	2 deg.
Aileron	Frise Type
Tail Airfoil (Fin and Rudder)	50 per cent Gottingen
Fin Setting	0 deg.
Incidence of Stabilizer	+4 deg.
Stabilizer Adjustment	+2½ deg. in flight
Total Wing Area, Incl. Ailerons	1110 sq.ft.
Center Section	207 sq.ft.
Wing Panels (2) Incl. Ailerons	903 sq.ft.
Total Aileron Area Aft of Hinge	110 sq.ft.
Total Vertical Tail Area	54.95 sq.ft.
Center Lower Fin	14.75 sq.ft.
Rudders (2) Incl. Balance	40.2 sq.ft.
Balance on Each Rudder	3.3 sq.ft.
Total Horizontal Tail Area	135.5 sq.ft.
Stabilizer	81 sq.ft.
Elevator	54.5 sq.ft.
Useful Load	7815 lb.
Crew—Pilot, Mechanic	340 lb.
Fuel and Oil	2025 lb.
Radio	180 lb.
Pay Load	5270 lb.
Passengers (20 @ 170 lb.)	3400 lb.
Mail and Baggage	1870 lb.
Weight Empty	9785 lb.
Structure	5590 lb.
Power Plant Complete	2556 lb.
Fixed Equipment	1639 lb.
Gross Weight	17,600 lb.
Wing Loading	15.8 lb. per sq.ft.
Power Loading	15.3 lb. per hp.

SOME GLIMPSES AT THE CO

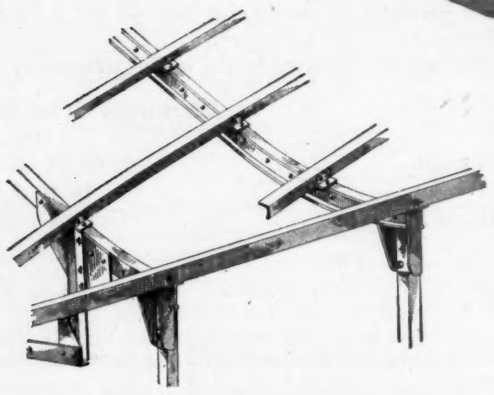
Consolidated "

Above: The tail group of the Commodore showing the externally braced monoplane stabilizer and double rudders. Right: The fin structure showing its attachment to the tail.



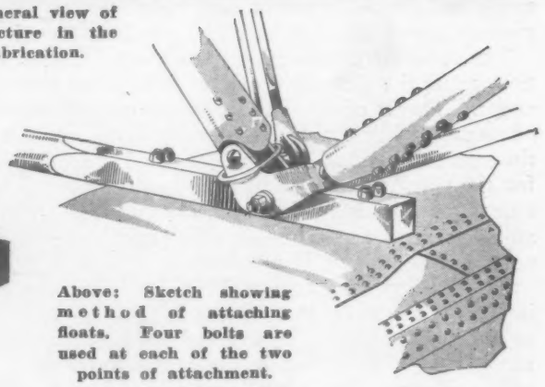


Left: Detail sketch showing attachment of plate girder and belt frames in the inverted hull structure.



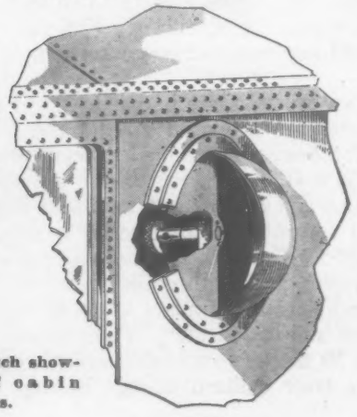
Above: Sketch showing attachment of longitudinal to transverse members in the inverted hull structure.

Above: A general view of the hull structure in the process of fabrication.



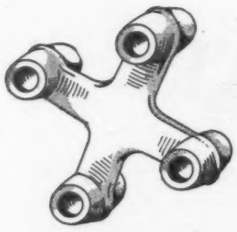
Above: Sketch showing method of attaching floats. Four bolts are used at each of the two points of attachment.

Above: A close-up of the port float of the Commodore. One of the cabin ventilators can be seen just behind the rear compartment windows.

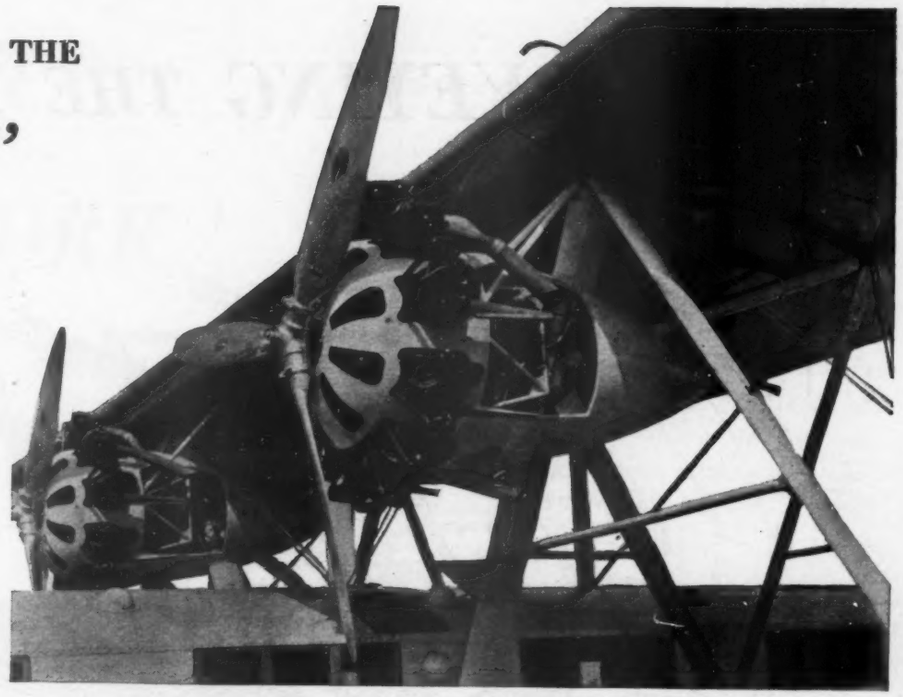


Right: Detail sketch showing installation of cabin ventilators.

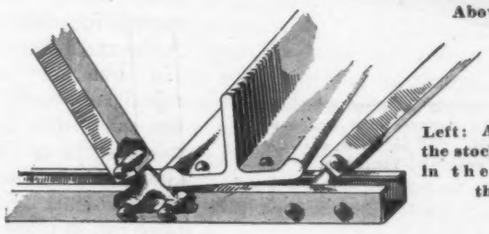
CONSTRUCTION OF THE *"Commodore"*



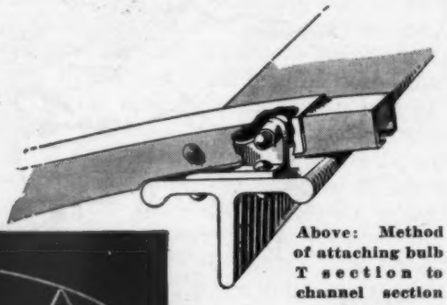
Above: One of the stock forgings used in the wing construction.



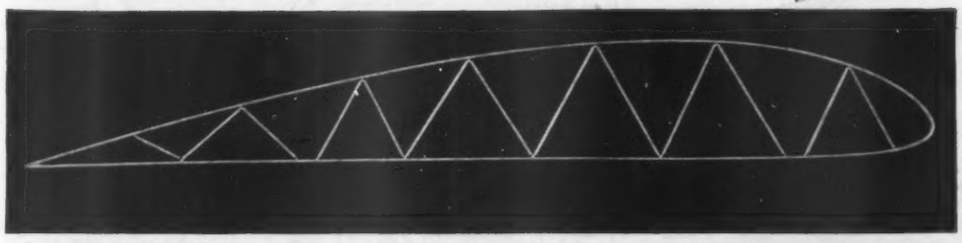
Above: Close-up showing external wing bracing and power plant installation.



Left: Applications of the stock forging used in the structure of the wing.

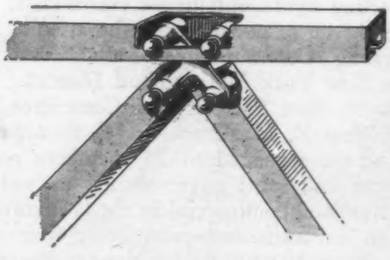


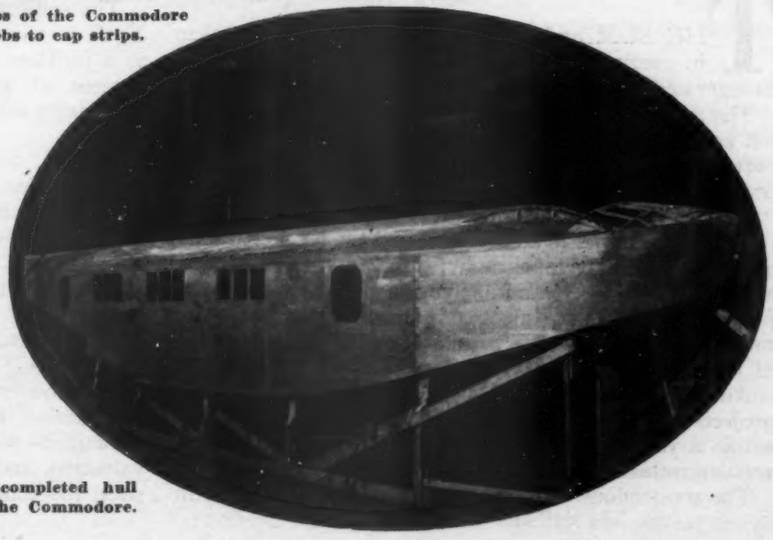
Above: Method of attaching bulb T section to channel section member.



Above: One of the Gottingen 398 metal wing ribs of the Commodore in which the stock forging is used to attach webs to cap strips.

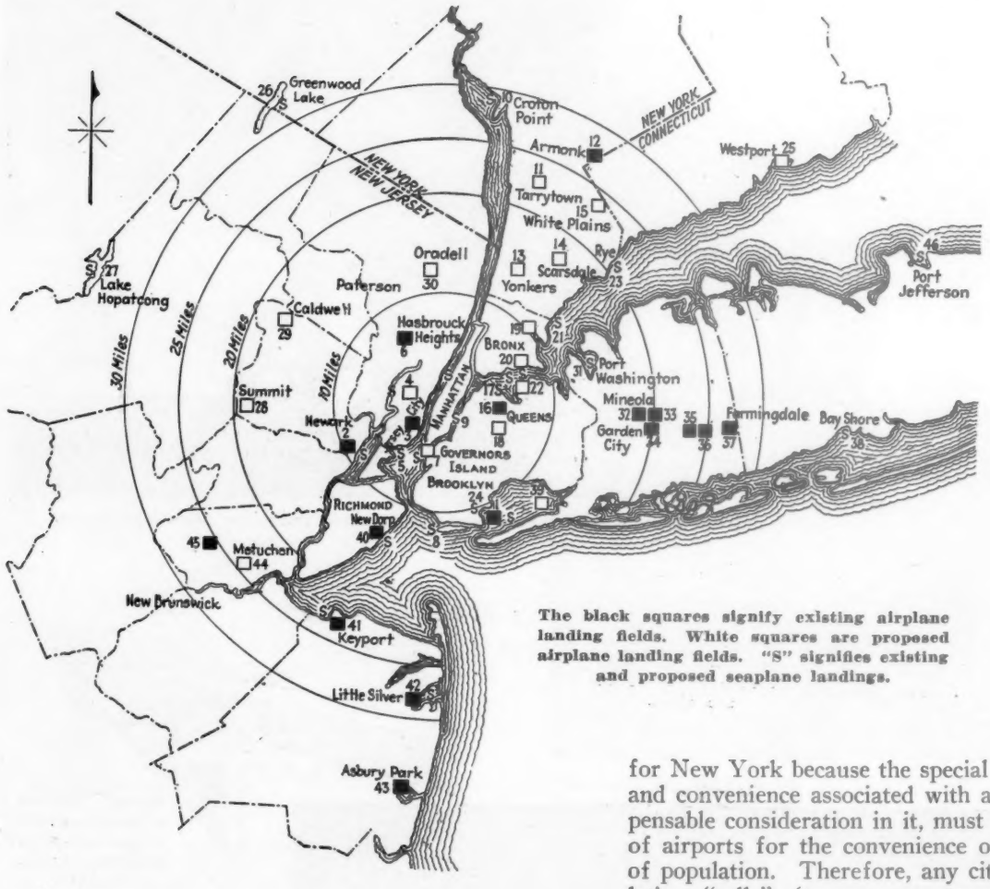
Below: Use of the stock forging in the construction of the rib.





Right: The completed hull structure of the Commodore.

SURVEYING THE *Airport* IN



The black squares signify existing airplane landing fields. White squares are proposed airplane landing fields. "S" signifies existing and proposed seaplane landings.

By JOHN C. HOLME, JR.

THE SUM and substance of the airport problem in every large city in the world is present in an exaggerated degree in New York City.

The metropolitan area provides many aviation termini, but none of them offers adequate facilities for air transport service in which every consideration of the air traveler is met.

Despite the abundance of waterways within the metropolitan area and its five boroughs, and the level character of the surrounding topography, offering suitable airport sites New York City and environs possesses no ports justifying the Department of Commerce Class "A" rating, and the same time within 30 minutes of the center of population.

Although a number of both land and sea airport projects are under way and probably will be completed within a year, New York City still does not possess the aerial terminal facilities offered by many smaller cities.

The tremendous increase in population, combined with the unusual features of the city's expansion, offers some excuse for this unfortunate situation. No aviation terminal comparable to the rail center termini such as the Grand Central and Pennsylvania Stations can be planned for New York because the special requirements of speed and convenience associated with air travel and an indispensable consideration in it, must be met by distribution of airports for the convenience of each separate center of population. Therefore, any city with as many population "cells" (to use a not-very-respectable political term) as New York, must, perforce have an airport for each individual "cell." Moreover, it is desirable and necessary that the various terminals be widely separated in order that they will not all be subjected to the same weather conditions simultaneously.

The subject of airport development in and about New York metropolitan area should therefore be regarded as a problem in co-ordination, rather than in the development of facilities now principally distinguished by their individuality.

IN 1927, the problem, brought to public notice by authorities, visiting flyers, intelligent enthusiasts, and far-sighted citizens was responsible for the appointment of the Fact-Finding Committee of Suitable Airport Facilities for the New York Metropolitan District.

President Hoover, then Secretary of Commerce, appointed Hon. William P. MacCracken, Jr., to organize this committee, which consisted of 24 members representing the federal and local governments, as well as "The numerous civic and commercial interests involved." In addition to an executive sub-committee, four sub-committees were chosen to consider location, engineering, valuation, and ways and means. In examining possible sites, the committee took five major points into consid-

Problem

NEW YORK CITY

New York's airport problem is of more than local interest. The whole nation is concerned with the transportation facilities of the nation's largest cities. The present article summarizes the background of airport requirements for the New York area. It will be followed by two others describing the present and proposed facilities for land planes and seaplanes, respectively. Mr. Holme shows how the problem has developed, and compares the recommendations of various committees that have surveyed New York's Airport requirements.

eration, 1. Accessibility; 2. Size, shape and approaches; 3. Suitability from the meteorological point of view; 4. Present value of property; 5. Cost of preparing site for initial development.

As a result of these investigations and in view of the fact that so many excellent sites were found available, it was decided that sites recommended for major airports by this committee must meet the Department of Commerce Class "A" requirements, and unless for some exceptional reason, must be within the 30-minute zone of rapid transit travel time to and from transportation terminals in Manhattan, and, must afford development of seaplane facilities.

The localities with suitable airport facilities as suggested by the Fact-Finding Committee.

A SURVEY of meteorological conditions in the metropolitan district has been made and may be summarized briefly as follows: there is practically no variation in either the general wind conditions or precipitation throughout the district nor in the total number of advection fogs (including both light and dense fogs of one hour duration or longer). However, the occurrence of dense fog (fog that obscures objects 1,000 ft. away) decreases very rapidly from the southern to northern portion of the district and slightly from the eastern to western portion. The records of the Weather Bureau show that dense fog occurs at Sandy Hook seven per cent of the days of the year; at the Battery, six per cent; at Central Park two per cent; at Mount Vernon, one per cent. The prevalence of radiation fog (ground mist) varies but slightly throughout the district, any one of the low flat areas being about as subject to fogs as any other. Most of the industrial smoke in the district originates west of Manhattan and is carried over the city by prevailing westerly winds. In general, the density of this smoke decreases from the southern to the northern portion.

At the time the Fact-Finding Committee made its preliminary survey, the metropolitan district contained three major military fields: Mitchel Field, Miller Field, and Rockaway Naval Air Station; and four major commercial airports: Hadley Field, Teterboro Airport, Curtiss Field and Roosevelt Field. In addition, there were a number of others, mostly unimproved, from which a certain amount of commercial and private flying has been carried on, and several which are charted as intermediate fields available for emergency use. There were ten of these unimproved or emergency fields within a 25-mile radius from central Manhattan.

In its report, the committee divided the district into six general localities, as follows: 1. Queens-Flushing Bay Area; 2. Newark Bay Area; 3. Bronx-East River Area; 4. Hackensack Meadows Area; 5. Jamaica Bay Area; 6. Wall Street-Brooklyn Area.

Ten sites were recommended as first and second choice

TACOMA PUBLIC LIBRARY

locations for additional development in these six areas.

First choice for the Queens-Flushing Bay Area is No. 18 on the accompanying map of recommended airport sites, the Juniper Valley site.

The time involved in transportation from Times Square, chosen as a logical starting point to most airports in the metropolitan area—as reported in this and succeeding articles—is an approximately accurate figure based upon actual test by the writer under normal traffic conditions. It is therefore fair to the airports to consider traffic congestion in New York City as operating against the express purpose of aviation—to speed transportation. It will be readily seen that these estimates will vary considerably depending upon where the start is made. From Wall Street to Long Island, parts of New Jersey, and to Westchester County, offers much more of a problem than when one starts from the Grand Central or Pennsylvania station districts.

It is thirteen minutes from the Pennsylvania Station to the Long Island Railroad's proposed station at Rego Park, the terminal for Site 61. Second choice for this location in Site 22, due east of College Point and adjacent to the Whitestone Branch of the Long Island Railroad.

There are now three airports in this area: Holmes, under construction, North Beach seaplane station, with proposals for the development of an adjacent airport, and New York City Airport, with seaplane accommodations, under construction on Site 22.

IN THE Newark Bay region, Site 2 (see map), recommended by the Committee, has since been completed in the initial form as Newark's Metropolitan airport. Provision for the ultimate enlargement and development of sea-plane facilities has been provided for by the City of Newark, owners of the Municipal port.

For a location in the Bronx-East River Area, Site 19, north of the Harlem Division of the N. Y., N. H. & Hartford Railroad, has since been adopted as a proposed Curtiss Airport.

Site 2, second choice, on the north bank of the East River, is near Old Ferry Point. There is apparently no available information on proposals for the development of this latter site.

A site northeast of Secaucus, is recommended as first choice for the Hackensack Meadows District and Site 4, northwest of Secaucus, bounded on the west by the Hackensack River and on the south by the Erie Railroad is second choice. The latter Secaucus site is now under construction for New York Air Terminals, Inc.

As first choice in the Jamaica Bay Area a tract of city-owned marsh land located on the proposed East Island of the Jamaica Bay project, was recommended, but has been definitely rejected by Borough President Harvey as being too far from transportation facilities. Site 39, a city-owned tract on the westerly shore of Jamaica Bay, north of Barren Island, and bounded on the southwest by Flatbush Avenue, was recommended by the Committee and is now under construction as the Floyd Bennet Municipal Airport. It will be supplemented by a seaplane channel to Jamaica Bay.

Site 7, Governor's Island, is ideal for the Wall Street-Brooklyn Area, but negotiations with the War Department for the development of this site for either seaplanes or landplanes have repeatedly failed of their object.

Co-ordination and development of airplanes in and about New York was also one of the major considerations of the experts who prepared the Regional Plan for New York and its Environs. This Plan, completed in 1929, is the result of seven years of research carried out under the direction of the Russell Sage Foundation at a cost of $1,000,000. Broadly, it covers all phases of traffic and transportation problems, as well as recreation and health centers, land regulation and protection, and other questions incident to furnishing adequate provision for a population of 21,000,000 in the metropolitan district.

SO FAR AS airport development is concerned, the Sage Foundation report goes further than the report of the Fact-Finding Committee in that it devotes more attention to the placing of airport sites in relation to proposed as well as existing rapid-transit facilities. The Sage Foundation report points out that accessibility is the logical prime consideration, because the abundance of waterways and flat land in the district provides almost innumerable possible sites. However, topography, freedom from obstruction and clarity of atmosphere have also received due consideration.

The Regional Plan therefore includes a summary of airport system proposals from which the following quotation is taken:

"In ten years about 22 landing fields have been constructed in the Region in connection with air transportation", (14 of which are commercial, 3 military, 2 municipal and 2 auxiliary fields). However, "development of service is likely to be hampered more as a result of the absence of provision than it is by difficulties in perfecting the airplane itself. . . There must be an intimate relation of airport terminals to population density because the uses made of air transportation for passengers, the extent which will make it economically feasible or otherwise, will depend largely upon the rapidity with which the largest number of people can reach their destination.

"In addition to the airports already acquired or in the course of construction, it is suggested as urgent that the following additional areas should be acquired in the near future:

1. Area comprising the marshlands in the Southern part of Bronx.

2. Development of a major airport in the northern part of the Borough of Queens at a site readily accessible from Manhattan.

3. Development of an airport adjoining Pelham Bay Park.

4. Development of Governor's Island as a major military landing field with privileges, if possible, for the accommodation of commercial transportation by air."

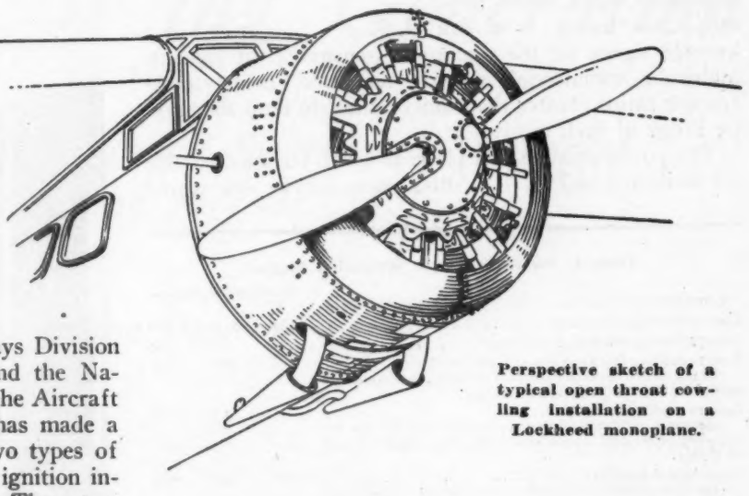
IT IS INTERESTING to note that to date, hardly two years after the publication of the report of the Fact-Finding Committee, five airports are under construction on the recommended sites in the six districts, three additional landing areas are being developed in the areas mentioned, adjacent to, but other than on recommended sites. Two of the sites have been definitely rejected, and present needs have not yet pushed development of the other three.

The publication of the Regional Plan is too recent to have had very much practical effect as yet, but it offers an excellent basis for genuine co-ordination of airport development adequate for the needs of the New York District, and it will undoubtedly be given serious consideration in the planning of all further projects for air transport facilities.

THE *Shielding Effect* OF N.A.C.A. COWLINGS

By F. H. DRAKE
and A. W. PARKES, JR.

Aircraft Division,
Radio Frequency Laboratories, Inc.



Perspective sketch of a typical open throat cowling installation on a Lockheed monoplane.

AT THE INVITATION of the Airways Division of the Department of Commerce and the National Advisory Committee for Aeronautics, the Aircraft Division of Radio Frequency Laboratories has made a quantitative investigation of the effect of two types of N.A.C.A. radial engines cowling in reducing ignition interference with radio reception on airplanes. These two cowlings will be subsequently termed the "Louvre" and "Open Throat" types. The Open Throat N.A.C.A. cowling, as its name indicates, offers to the air which has been induced to flow smoothly around the cylinders a passage back along the fuselage through an open throat; and is the type of cowling currently famous through its efficiency in decreasing the parasite drag on the motor. The Louvre N.A.C.A. cowling has, in place of an open throat, a number of louvres in the rear section of the cowling for egress of the air from about the cylinders. Although this more recent type of cowling has not yet proved as efficient in decreasing the parasite drag as the earlier open throat type, its sponsers feel confident that it can, with slight modifications, be made practically as effective in this respect.

Apparatus for quantitative measurement of ignition interference

Since each type of cowling consists essentially of a grounded sheet-metal cylinder around the periphery of the engine, some reduction in the ignition interference with radio reception on the plane would naturally be expected from its use. It was to investigate this effect that the following experiments were made.

A radio receiver of high maximum sensitivity and calibrated for microvolt sensitivity ["Microvolt sensitivity" is defined as the number of microvolts of radio frequency input (modulated 30 per cent at 400 cycles) required in a standard 100 mmf. resistanceless antenna to produce 15 r.m.s. audio volts across a 4,000 ohm pure resistance output load.] against the position of the gain control at a wave length of 1000 m., was mounted on a small truck along with a 6 ft. vertical antenna and necessary batteries. The metal floor of the truck served as ground. For various conditions and types of cowling on a Stearman biplane (Wright Whirlwind Engine) and on a Curtiss biplane (Wasp Engine) the relative ignition interference at three positions about the plane was determined by finding the point to which the microvolt sensitivity of the receiver had to be reduced to make the ignition interference just audible. The interference ratios for various positions and conditions of cowling are then directly as the corresponding permissible re-

ceiver sensitivities thus found. *An interference ratio of unity at a certain position means that a receiver with a microvolt sensitivity of 10, used in this position with a vertical antenna having an effective height of one meter, will be capable of just hearing the ignition disturbance.* Ratios greater than unity indicate correspondingly higher ignition interference levels. The figure of 10 microvolts sensitivity, upon which these ratios are based, is a fair average figure of the maximum sensitivity of modern multitube commercial aircraft receivers; hence interference ratios greater than unity definitely limit the service range of such receivers.

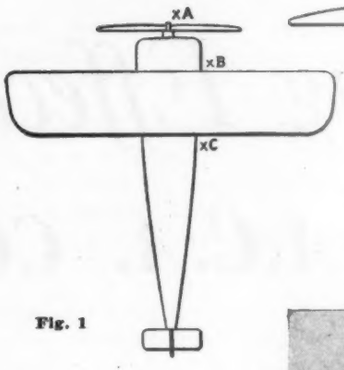


Fig. 1

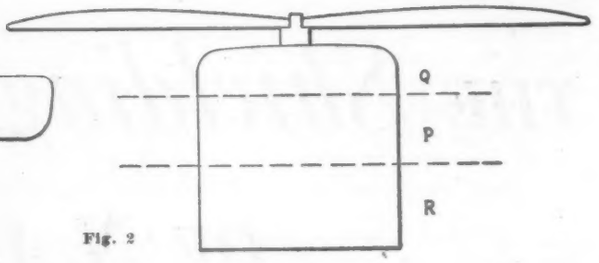


Fig. 2

The positions about the plane at which tests were made are indicated in Fig. 1. Although in service one would never want to place an antenna at position *A* nevertheless the readings obtained here serve as a qualitative check on the readings at the other positions.

Table I—Stearman Plane, Whirlwind Engine

Conditions of Cowling	Interference Ratios *A*	*B*	*C*
Louvre cowling (complete)	82	1	2.8**
Louvre cowling (section *P* removed)	91	82	45
Louvre cowling (sections *P* and *R* removed) (In the above cases the ignition shielding was complete except for the unshielded spark plugs).	410	590	68
Louvre cowling (complete) (Here the ignition shielding is complete save for the unshielded plugs and unshielded leads from ignition ring to plugs).	91	65	2.8
Open-throat cowling (Ignition shielding complete except for unshielded plugs and unshielded leads from ignition ring to plugs).	630	163	420

**The slight interference at this position was conducted from the exposed plugs by leads from thermocouples in the cylinders to meters in the front cockpit. This apparatus was installed temporarily to check the temperature of the cylinders when the Louvre cowling was used.

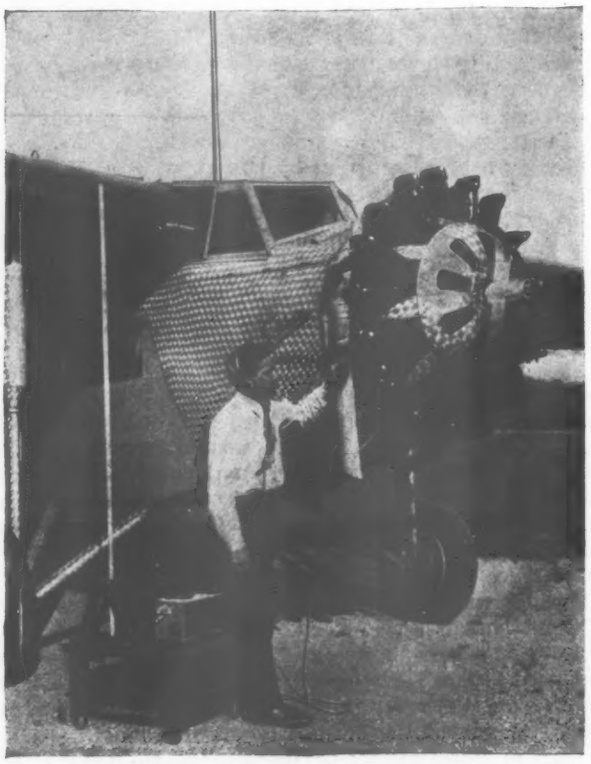
In Fig. 2 is a simple notation for the various sections of the Louvre cowling. Section *R* contains the louvres. The Open Troat cowling is built in one large section, somewhat larger in diameter than the Louvre cowling to permit the air to pass out at the back.

The Stearman plane was completely shielded except as specified above, that is, all magnetos, low and high tension leads and ignition switch were completely enclosed by metallic conductors.

In order to determine what reduction in ignition interference would result from the use of the regular open-throat cowling on an otherwise unshielded engine, tests were made on a Curtiss Hawk with a Wasp engine. Results are shown in Table II:

Position *C* of the measuring apparatus is a condition which corresponds roughly to operating conditions using a rod antenna on an open airplane. Previous experience with service installations on single-engined planes having a rod antenna at this position has indicated a figure of the order of 6000 microvolts for the sensitivity of a commercial receiver at which the ignition interference is just audible with no shielding whatever. This is consistent with the figure 590 (sensitivity 5900 microvolts) recorded under condition *C* and with no shielding in the present experiments.

From the above sets of data certain general conclusions may be made. In the first place, it is apparent from the results on the unshielded engine that the use of the regular open-throat cowling is in no sense a substitute for general shielding of the ignition system. Although the "Louvre" type of cowling would doubtless shield considerably more, there is little reason to hope in the light of the other data above, that even this will provide adequate suppression of the ignition interference.



Ignition test receiver and probe antenna being used to determine adequacy of ignition system shielding.

Table II—Curtiss Hawk, Wasp Engine

Conditions of Cowling	Interference Ratios *A*	*B*	*C*
Open-throat (No other ignition shielding).	1,600	2,100	410
No cowling (No other ignition shielding).	2,500	2,100	590

The only advantage from a radio standpoint in the use of the N.A.C.A. cowling appears to lie in the possibility of getting along *without shielded spark plugs* with the Louvre type of cowling but with an otherwise completely shielded ignition system. This advantage from the use of the cowling is by no means unimportant.

CONSTRUCTION OF *Airfoil Sections* AND *Wing Generation*

The First of Two Articles on a Systematic Method of Designing Airfoils

By JEAN FRADISS and ARMAND THIEBLOT

IN PREVIOUS ARTICLES (Analysis of the Wing) we have seen that the selection of an airfoil section is governed by the choice of certain coefficients or characteristics. The purpose of this paper is to give a means of designing, of constructing graphically, an airfoil section having certain desired characteristics. The method which leads to this result allows the engineer to replace research at random, which so far has been of widespread use, by a *systematic and rational* investigation.

Two problems are involved: The construction of theoretical airfoil sections, and the generation of wings by variation of an airfoil along the span.

These problems which pertain to advanced wing theories and aerodynamics are naturally very complicated, and the few authors who have treated these questions have always dealt much more with the theoretical side than with the practical aspect of it. This most interesting and important theory of airfoil sections and wing theory which has been developed only in the last few years is yet little known.

Our purpose is to give every aeronautical engineer a method of designing his own airfoil sections and wing to suit his ship which does not involve calculus and analytic geometry, despite the fact that they are necessary for a rigorous proof of this method.

These articles will contain two parts: first, we have tried to present in a few pages a very much simplified and condensed outline of the method of construction of theoretical airfoils and wings without any mathematical development or detail, for this can be found in several works, to which we refer below. The first part is given only for reference and explanation for the second part, and the reader who is interested in aerodynamics.

In the second part we shall present the practical method of graphical construction of theoretical airfoils and wings.

The theory of wing section, originated by Kutta and Joukowsky who gave the expression of the lift coefficient for an airfoil section moving in a perfect fluid and having an infinite span, was subsequently developed by Prof. von Mises in Germany and Messrs. Toussaint and Carafoli in France.

The theory of Prantdl gives a means of interpreting the theory for wings of finite span.

THE PURPOSE of the investigation is to obtain, for each particular case, an airfoil section superior to any listed in the tables, or determined by the "cut and try" method.

This does not mean that the first airfoil constructed will necessarily be more satisfactory than any other, but it means that by replacing research at random by a systematic study of the variation of the characteristics with certain coefficients of the airfoil, one is sure to reach a better result—a fact which is obvious and has been proven by experience.

Certain properties of airfoils designed according to the following method are known in advance and without any tunnel test; namely: moment coefficient, pressure distribution, location of the focus, location of line of zero lift, etc.

In fact, it is possible to give to the airfoil any moment coefficient, of course as a function of the other characteristics.

In a wing generated as described below, the arbitrary variation of the characteristics of the airfoil sections is replaced by an aerodynamic variation. The principal advantages are: generally a better fineness ratio and a more efficient wing, the exact knowledge of the lift distribution, of the location of the center of pressure of the moment coefficient, of the optimum angle of the airfoil sections along the span.

It is possible to choose in advance the resultant moment coefficient of the wing and the law of variation of this

coefficient along the span. For instance, if instead of being constant it is smaller at the tip and higher at the root, the resultant torsion on the wing is decreased.

This is very important especially for wings of the cantilever type not only in reducing torsion but also in eliminating the danger of wing flutter.

The appearance of this phenomenon is not solely dependant upon the statical strength of the wing—in other words, wing flutter cannot always be eliminated by an increase of strength. The danger of wing flutter increases with:

1. The center of pressure travel.

2. The fact that the cruising angle of attack is near to the angle of zero lift.

3. The lack of torsional rigidity.

Therefore, in designing a wing, a small moment coefficient and a small center of pressure travel will be chosen, the moment coefficient decreasing from the root to the tip for both the cantilever and the semi-cantilever type.

In the center section a slightly higher moment coefficient may be used on account of the good resultant aerodynamic characteristics, because the deformation of the wing near the fuselage attachments is always comparatively small. But at the wing tip, on the contrary, a section with a small displacement of the center of pressure will be used. Another important feature of wings with a small moment coefficient is their great inherent stability.

So far as strength of materials is concerned, the decrease of the torsional moment is not the only advantage; for instance, a parabolic variation of the thickness along the span allows the construction of spars of uniform strength.

The relative incidence of the different airfoil sections; i.e., the law of variation of the incidence along the span, is determined in such a way that each section, for example, is at its angle of minimum drag or of maximum fineness ratio for a given angle of attack (of the mean section, for instance). This relative incidence should depend upon the purpose of the ship, but it seems that the more advantageous setting is the one corresponding to the zero lift incidence. We recommend this setting for the following reasons:

1. The calculations are easier.

2. The balance of the airplane is easier because in this case the location of the focus of the sections and the resultant focus of the wing are known, and the location of the focus determines the location of the center of gravity of the airplane.

In a previous article the focus of an airfoil section has been defined as a point of the plane of the section such that the aerodynamic forces acting on this section can be resolved with respect to this point into a force equal to the lift and a couple constant with the incidence. (This constant couple is equal to the moment coefficient with respect to the focus at zero lift; K_{mo}.)

The couple of the resultant of the forces acting on the wing being constant with respect to the focus of this wing, if the center of gravity of the airplane is located on the vertical passing through the focus of the wing (assumed to be at the angle of attack corresponding to level flight at cruising r.p.m.), and if we assume that the couple due to the tail is proportional to the angle of attack, the total couple acting on the plane will be proportional to the angle between the actual position and normal position of flight.

If all the external forces acting on the airplane are resolved with respect to the focus of the wing, and not with respect to the center of gravity of the airplane as is generally done, it is possible to put in a simple mathematical form the equations of the static stability of the ship.

Therefore the study of balance and static stability of an airplane having a wing determined this way may be carried out in full without any tunnel test.

3. The setting of the airfoil sections at the incidence corresponding to zero lift has another important feature: Let us suppose that, at the position of zero lift for the wing, the sections have any relative incidence; the general resultant of the lift is equal to zero while some sections have a positive lift and others a negative lift. Therefore in certain cases of flight, such as dive, local bending stresses will be added to the normal torsional stresses, thus creating additional stresses in the members. The magnitude of these stresses may be considerable and particularly hard to determine; furthermore, the efficiency of such a wing is low. This setting may also cause flutter.

ANOTHER CHARACTERISTIC of a wing with the section set at zero lift is a great fineness ratio at the angles for which K_y is small.

Therefore we have seen that the problem consists of designing an airfoil section (generally the center section) in such a way that this section has certain aerodynamic characteristics and reducing the other sections following a continuous and decreasing law, by varying the chord, K_{mo}, the thickness ratio or any other geometric or aerodynamic characteristics of the airfoil section, from the root to the tip.

Wings designed in this manner have a thick airfoil at the root and are thinned at the tips. They are also tapered in plan form.

The advantages of such a wing over a wing with a constant airfoil section are well known.

Nevertheless, for the purpose of wing design, we will note the following differences between thick and thin airfoils:

The thick airfoils have a greater lift than the thin airfoils, because they have generally more camber of the centerline.

The zero lift for thick airfoils occurs at smaller angles and the maximum lift at larger angles than for thin sections.

The minimum drag is generally greater for thick sections than for thin sections, but increases less rapidly with the angle of attack. With the method developed below, it is possible to reduce the $K_{x\,min.}$ of thick sections to the values obtained by the best thin sections.

The center of pressure is generally located further forward for flat-bottomed or in particular biconvex thick sections, and the center of pressure travel is smaller than for the sections with a concave lower camber. A wing having a moderate convex camber at the center section has a better efficiency at high speed and is more stable.

A thick airfoil generally has its burble point at a greater angle of attack than the thin airfoils. Therefore the thick sections have better characteristics at high angles.

The investigation of the pressure distribution that will be given below shows that the center of pressure travel is proportionately smaller near the center of a tapered

wing than near the tips; the consequence of this phenomenon is that the center of pressure travel for the total wing is practically independent of the taper in plan form.

The aerodynamic characteristics of a family of airfoils depends more upon the mean thickness ratio than upon the taper in thickness ratio. The efficiency of thick wings thinned at the tip is always higher than that of a wing of rectangular plan form and of constant section. In addition to increased aerodynamic efficiency the use of thick wings also permits a lighter structure.

Résumé of the Theory of the Wing Section

IN THIS THEORY the air is considered as a continuous, homogeneous medium, non-viscous and incompressible; that is, as a perfect fluid.

The motion is assumed to be in a plane (two dimensional motion) and to be irrotational, that is, if we consider any small particle in the fluid, its angular velocity is equal to zero.

The theory of the airfoil section is based upon the determination of the velocity at all points of the fluid in which the airfoil section is moving. When the distribution of the velocity in the fluid is known, the distribution of pressure is also known from Bernoulli's equation $\left(P = \text{constant} - \frac{\rho}{2} V^2\right)$ but it is quite impossible to determine directly by means of mathematical procedure the velocity at any point on any given airfoil section. This determination can be made only for sections of elementary form and is generally studied for linear[1] and circular[2] sections.

The application of the property of the analytic function gives a means of transforming the velocity distribution around a circle into the velocity distribution around an airfoil determined from the circle by a certain function of transformation.

Flow Past a Circle

THE VELOCITY is expressed in terms of u and v, its components respectively along the co-ordinate axes ox and oy; ox being parallel to the direction of the general motion of the fluid.

It is shown in hydrodynamics that when the motion is irrotational, there exists a certain function $f(x, y)$ such that its derivatives for a given point with respect to the co-ordinates give the projections of the velocity of the fluid at this point upon the axes of co-ordinates considered, that is:

$$u = \frac{\partial \varphi}{\partial x} \qquad v = \frac{\partial \varphi}{\partial y}$$

This function is called the velocity potential. The velocity at each point of the fluid can be represented by a vector. A line drawn in such a manner that the velocity vector is tangent to this line at every point along its length is called a stream line, and a series of such lines give a graphical representation of the flow.

The differential equation of a stream line is obtained by writing that the projection of a small element d_s of this line is proportional to the projection of the velocity:

$$\frac{dx}{u} = \frac{dy}{v} \text{ or } u\,dy - v\,dx = 0$$

Let $d\psi = u\,dy - v\,dx$, then $d\psi = 0$ and $\psi =$ constant $\psi = C$ represents therefore a stream line and the flow past any body is conveniently obtained, when knowing the function ψ; a series of values is given to the constant C.

The function ψ is called the stream function and represents the quantity of fluid which flows between two adjacent stream lines. Referring to Fig. 3, let AB and CD be any two adjacent stream lines. Since by definition there is no flow across a stream line, the flow across MM_1 is equal to the flow across dy plus the flow across dx. Then, if $d\psi$ is the flow across MM_1,

$$d\psi = u\,dy - v\,dx$$

ψ being a function of x and y. $d\psi$ may also be written

$$d\psi = \frac{\partial \psi}{\partial x} dx + \frac{\partial \psi}{\partial y} dy$$

or

$$u = \frac{\partial \psi}{\partial y} \text{ and } v = -\frac{\partial \psi}{\partial x}$$

The projection of the velocity can be expressed by the stream function as well as by the velocity potential:

$$u = \frac{\partial \varphi}{\partial x} = \frac{\partial \psi}{\partial y} \qquad v = \frac{\partial \varphi}{\partial y} = -\frac{\partial \psi}{\partial x} \qquad (1)$$

The flow past a circle is conveniently expressed in terms of the stream function. As indicated above this function represents the stream line of the flow; therefore, in the present case this function must be determined so that for a certain value of the constant, the corresponding stream line is the circle considered—and when the value of the constant increases the stream lines become straight lines parallel to the axis ox (the method of images by considerations of sources and sinks[3] illustrates the establishment of the stream function for the flow past a circle. These considerations are nothing more than a pure mathematical procedure used to obtain a function having the above characteristics.

Let $$\psi = -Uy\left(1 - \frac{a^2}{x^2 + y^2}\right)$$

be the stream function.

Where U is the projection of the velocity on the axes ox as y approaches infinity.

The stream line $\psi = 0$ is represented by

$$uy\left(1 - \frac{a^2}{x^2 + y^2}\right) = 0$$

which gives the two stream lines $y = 0$

and $$1 - \frac{a^2}{x^2 + y^2} = 0 \text{ or } x^2 + y^2 = a^2$$

which is the equation of a circle.

The stream lines for different values of ψ can be drawn easily and are shown in Fig. 4. From the stream function considered above it can be seen that the velocity distribution is symmetrical with respect to the axis ox, and therefore, the pressure distribution; hence there is no resultant force perpendicular to ox acting on the cylinder having for its base the circle in question. In order to obtain an unsymmetrical distribution of the velocity, a second flow is superimposed on the first one. This flow is assumed to circulate around the circle, and

---

[1] *Elements of the wing section theory and wing theory by Max M. Munk. Rupper: 191, National Adv. Com. for Aeron.*

[2] *Theory et traces des profils d'piles sustentatrices by Toussaint et Carafoli. (Etienne Chiror, Paris.)*

[3] *See—Elements of airfoil and airscrew theory by H. Glauert. (The Macmillan Co., N. Y.)*

therefore it increases the velocity on one side and decreases it on the other.

The stream function corresponding to this flow is

$$\psi = -\frac{\Gamma}{2\pi} ln\ R.$$

This function is determined by the following conditions:

1. The radial velocity is zero.
2. The tangential velocity is constant, independent of angular position of the radius vector, and is inversely proportional to the radius.

The velocity along the tangent is given by:

$$\frac{\delta\psi}{\delta R} = v'$$

The velocity along the normal is:

$$\frac{1}{R}\frac{\delta\psi}{\delta\theta} = u'$$

then

$$\frac{\delta\psi}{\delta R} = \frac{\Gamma}{2\pi R} \text{ (A)} \qquad \frac{1}{R}\frac{\delta\psi}{\delta\theta} = 0 \text{ (B)}$$

The expression of the stream function is the integration of the equation (A)

$$\psi = -\frac{\Gamma}{2\pi R} ln\ R$$

The constant Γ, which is called the circulation, is found from equation (A)

$$v' = \frac{\delta\psi}{\delta R} = \frac{\Gamma}{2\pi R}$$

$$\Gamma = v' 2\pi R$$

Thus the circulation is equal to the product of the velocity by the length of the circular stream line enclosing the circle. Hence the general expression for the stream function of the flow past a circle can be written

$$\psi = -Uy\left(1 - \frac{a^2}{R^2}\right) - \frac{\Gamma}{2\pi} ln\ R$$

The same flow can be expressed in terms of the velocity potential and has the following potential function:

$$\phi = -Ux\left(1 + \frac{a^2}{R^2}\right) + \frac{\Gamma}{2\pi}\theta$$

where

$$\theta = \tan^{-1}\frac{y}{x}$$

In a similar manner as for the stream function, for a series of constant values of ϕ a corresponding series of lines may be drawn in the plane x . y. These lines are called equipotential lines.

The relations

$$\frac{\delta\varphi}{\delta x} = \frac{\delta\psi}{\delta y} \qquad \frac{\delta\varphi}{\delta y} = -\frac{\delta\psi}{\delta x}$$

give

$$\frac{\delta\varphi}{\delta x}\frac{\delta\psi}{\delta x} + \frac{\delta\varphi}{\delta y}\frac{\delta\psi}{\delta y} = 0$$

$\frac{\delta\varphi}{\delta x}, \frac{\delta\varphi}{\delta y}$ are proportional to the direction cosines of the normals to the equipotential lines and $\frac{\delta\psi}{\delta x}, \frac{\delta\psi}{\delta y}$ are proportional to the direction cosines of the normals to the stream line, this relation shows that the equipotential lines intersect the stream lines at right angles. It is shown in the theory of the functions of a complex variable that a function representing two curves intersecting at a certain angle in a given plane can be transformed into another plane in which the curves representing the function having a different location intersect again at the same angle. This transformation is called conformal transformation. Hence, the family of equipotential and stream lines may be transformed from one plane to another, if it is possible to obtain the expression for those curves in terms of an analytic function.

While a rigorous mathematical demonstration of this fact lies outside the scope of this paper, it can easily be shown that the possibility exists of obtaining such an expression.

Let

$$F(Z) = R + R'i$$

be a function of a complex variable $Z = x + iy$ (R and R' being two real functions of x and y, and $i = \sqrt{-1}$).

The derivative with respect to x gives

$$F'(Z)\frac{\delta Z}{\delta x} = F'(Z) = \frac{\delta R}{\delta x} + i\frac{\delta R'}{\delta x}$$

and the derivative with respect to y

$$F'(Z)\frac{\delta Z}{\delta y} = iF'(Z) = \frac{\delta R}{\delta y} + i\frac{\delta R'}{\delta y}$$

or multiplying by i we have, since $i^2 = -1$:

$$F'(Z) = -\frac{\delta R}{\delta y}i + \frac{\delta R'}{\delta y}$$

consequently,

$$\frac{\delta R}{\delta x} = \frac{\delta R'}{\delta y} \quad \text{and} \quad \frac{\delta R}{\delta y} = \frac{\delta R'}{\delta x}$$

The same relation exists between R and R' as between the functions ϕ and ψ, and therefore the real part of a function of a complex variable may represent the velocity potential and the imaginary part the stream function.

The complex function

$$\omega = \phi + i\psi = f(Z)$$

is called the potential function of the flow, when the complex variable $Z = x + iy$ describes the plane (as in the study of function of a complex variable) $f(Z)$ describes the equipotential and stream line of the flow.

We have seen that

$$\psi = -Uy\left(1 - \frac{a^2}{R^2}\right) - \frac{\Gamma}{2\pi} ln\ R$$

and

$$\phi = -Uy\left(1 + \frac{a^2}{R^2}\right) + \frac{\Gamma}{2\pi}\theta$$

then

$$\omega = F(Z) = -U\left(Z + \frac{a^2}{Z}\right) - i\frac{\Gamma}{2\pi} ln\ Z$$

represents the potential function of the flow past a circle in terms of the complex variable Z.

The derivative of the potential function $f(Z)$ with respect to x gives

$$\frac{\delta f}{\delta x} = \frac{df}{dZ}\frac{\delta Z}{\delta x} = \frac{df}{dZ}\left(\text{since } \frac{\delta Z}{\delta x} = 1\right)$$

hence

$$\frac{df}{dZ} = \frac{\delta f}{\delta x} = \frac{\delta\varphi}{\delta x} + i\frac{\delta\psi}{\delta x} = u - iv = w$$

which is called the complex velocity.

The derivative of the potential function with respect to the complex variable gives the projections of the velocity on the two axes ox and oy.

A COMPARISON OF England's TWO NEW Airships

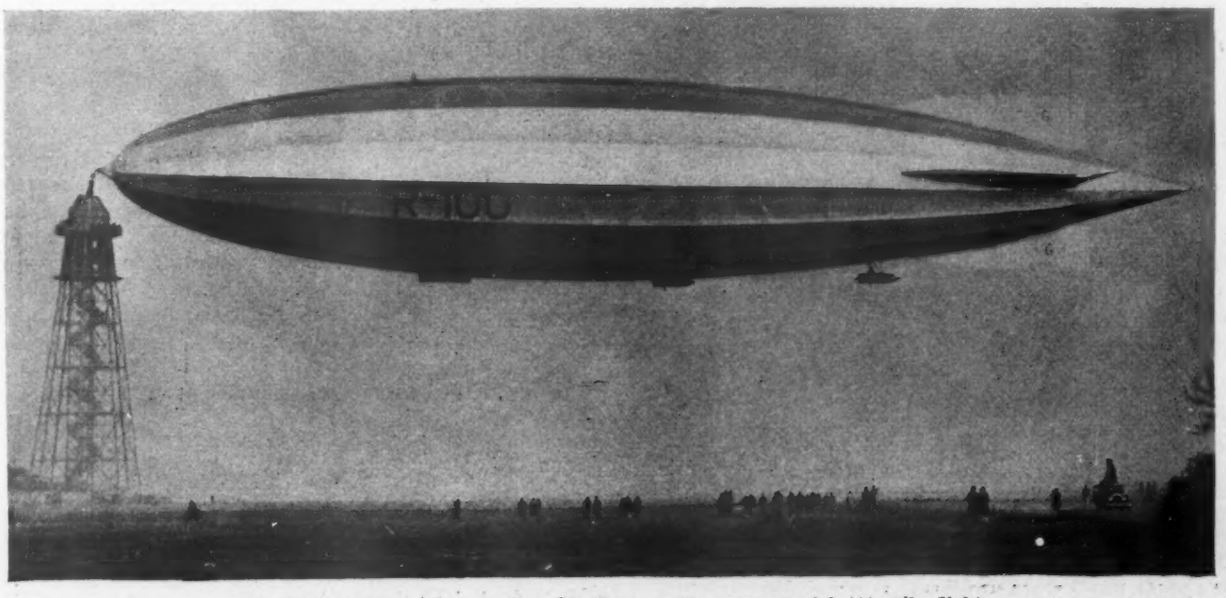
By AVIATION'S British Correspondent

THE R. 100 England's second major airship to be completed within six months, was launched Dec. 16 at the Howden airship base of the Airship Guarantee Co., flown 140 mi. to the Cardington Royal Airship Works and there moored to the tower which until recently had been used constantly for the mooring and testing of the R.101, a sister ship. A second flight followed this maiden trip, following which it was decided to house the ship in Cardington's other available hangar for a thorough study of the behavior of the envelope. The R. 101 had been returned to its hangar for general overhaul and to make room for the new arrival at the mooring mast. Commander Burney built the new airship.

The launching of this new airship once more has attracted wide spread interest to the lighter-than-air field, especially in the light of the recent performances of the R.101, which has just completed its test and demonstration flights with a high degree of success. A description of the former inevitably involves comparisons with the latter. This article must deal chiefly with the structural differences, however, since performance figures are lacking for R.100, with the exception of those derived from the flight from Howden to Cardington.

Such an unexpected and abrupt cessation of test flights pending examinations of the ship's envelope serves to focus attention immediately on the situation which has cropped up there. Omitting the general description of the new dirigible for the moment, we shall explain the nature of the trouble encountered, the circumstances under which it developed and the results.

It is necessary first to explain how the envelope is attached to the R.100 in comparison with the method of R.101, the State airship, which has given no trouble whatever and has ridden out gales of 83 m.p.h. at the masthead. R.101, it will be recalled, has fifteen main longitudinals and an equal number of intermediate reefing girders which screw out to keep the cover taut, while the envelope is always subject to a constant pressure



The R-100 moored at its mast at Cardington after a successful 140 mile flight.

from inside by air from intakes at the nose and tail. Breathing gills amidships let out any excess over the desired positive pressure. The system has worked successfully and with 32 main and secondary longitudinals and the positive pressure the envelope has always remained smooth and stable, giving as perfect a streamline shape as can be devised. The disadvantage of this system is that the reefing girders add about four tons to the structural weight.

R. 100 is not fitted with these reefing girders. Thus the envelope, stretched over the sixteen longitudinals, presents flat surfaces. In order to stabilize the envelope it is drawn inward by a series of circumferential wire rings at 3-ft. intervals inside the ship. These attachments cause the envelope to be concave between each set of longitudinals. The envelope and wire ring thus make two concave arcs between each set of girders and this in theory should make the envelope inherently stable. Instead of providing internal pressure, it has been arranged for air to enter and pass out of the envelope through large breathers on the under side of the ship so that the cover may be as far as possible in balance against dynamic lift forces.

The natural outward suction over a streamline shape apparently is relied upon to help maintain the cover taut in flight and this system, if it proves sound, has, of course, the merit of being much lighter than that of R.101. But when the ship appeared over Cardington on her maiden flight the condition of the envelope at once attracted attention and aroused some concern. Instead of being smooth and almost a true circle as in R.101, the cover was pitted throughout where the tie points resisted the outward suction. Some pits were more noticeable than others, suggesting that tensions were unequal. There was definite rippling of the envelope at certain points, especially where the slipstream from the side cars impinged on the envelope, and the lower rear fin, which is in the slipstream of the rear engine car, obviously needed scrutiny.

The whole fabric of the fin was undulating and an elastic sealing strip over the rudder hinge was bulging out. Curiously enough the movement of the fabric on the fin did not appear to be so ominous to those in the ship, and the next day a series of flights were made over the airport with observers on the ground taking notes while experts in the fin itself watched the fabric from inside.

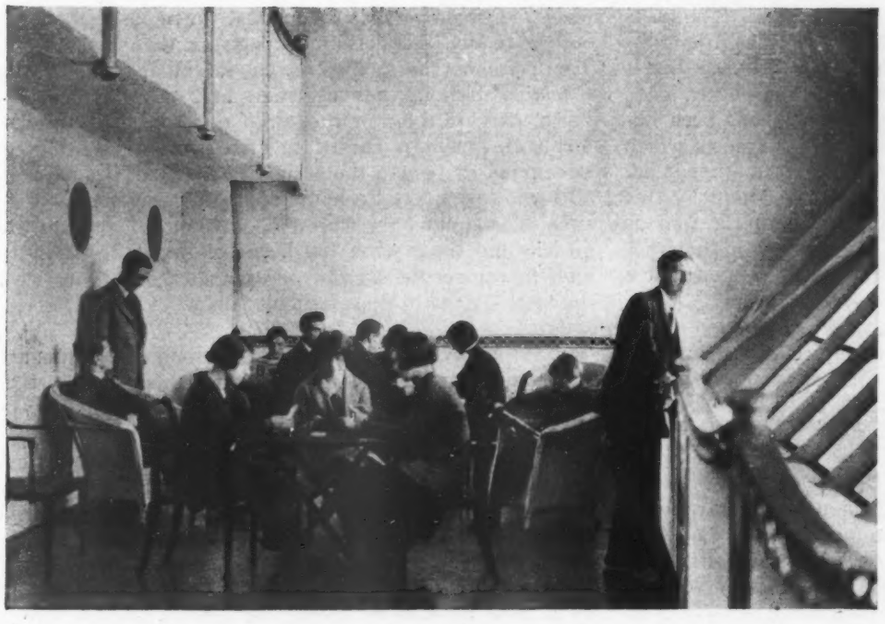
The R. 100 under construction at the Airship Guarantee Company plant at Howden in Yorkshire.

DURING this flight part of the sealing strip referred to broke away from the fin and was temporarily repaired in flight. It was decided that until the fin trouble had been further investigated it was undesirable to make full speed trials or to leave the ship at the masthead in the treacherous British winter until it was known how she would behave at full speed. It was then stated that not only will the fin fabric be examined but certain adjustments also must be made to the ring wiring system of the outer cover generally. If this proves merely a necessary adjustment after first experience of flying conditions, it is not serious; but if the system itself is under suspicion then the matter assumes another complexion. In any case it is difficult to avoid the conclusion that the concavity of the sides, the way the girders are sharply marked and the general pitting of the cover must entail a higher drag than in the case of R.101.

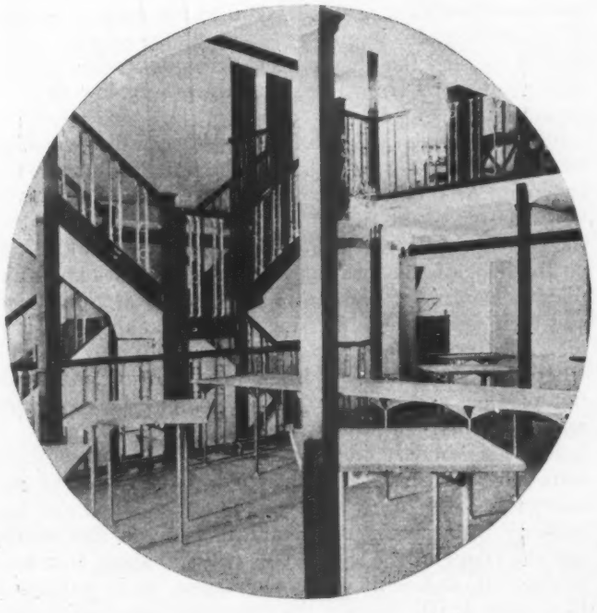
So far as the handling of the ship is concerned, Maj. G. F. Scott, in charge of flying trials, reported that R.100 handled nicely but in a different way from R.101 and was easy to control. No effort had been made to drive the ship at speed, but the speeds realized correspond fairly closely with the design figures. With the engines running at 1,400 r.p.m. (500 r.p.m. below maximum), a speed of 57 m.p.h. was realized and there was no vibration, while the ability to use three of the six engines for reverse gave greater control at low speeds.

Turning now to the constructional and design features of R.100, it must be pointed out first that R.100 is primarily of duralumin while the principal members of R.101 are of high tensile steel. Although designed to the same specification as to performance, R.100 is totally dissimilar to R.101 and may be said to follow more the principles of the Zeppelin type. The analogy cannot be pushed very far for in every way earlier practice has been improved. As in R.101 frames and longitudinals were not riveted up in situ. Instead, special screwed joints known as "spiders" were designed for all junction points on an ingenious jig which permitted a large number of joints with varying angles for the setting of the components to be made from the one master jig. The same fat shape has been adopted as in the State ship, and the fineness ratio—5.3 to 1—is, if anything, greater than in R.101.

The power units are six instead of five. These are Rolls Royce Condor III B petrol engines of 650 hp. each, giving a total of 3,900 hp., and these are divided between three cars. Two of these are 360 ft. from the bow, approximately amidships, and well in rear of the passenger accommodation; the third car is 90 ft. further aft. The



Above: View of the verandah of the R-100. Below: Section of the dining-room showing staircase to upper and lower decks



R.100 scores over R.101 here in regard to weight for in R.101 the power eggs total 21 tons while those for R.100 weigh only ten tons with a total horsepower of 3,900, a top speed of 80 m.p.h. and estimated cruising speed of 71.5 m.p.h.

The cars have certain novel features in that the center portion only is slung to the hull, the front and rear engines being bolted on much as an airplane engine is fixed to the fuselage. It is claimed that this will enable a complete engine to be lowered from the ship while moored at the mast and another hauled up and bolted into place. A derrick is provided for this job and all the controls, auxiliaries, radiators and oil tanks remain undisturbed in the center portion of the nacelle.

The propellers are, of course, tractors and pushers. Originally Comdr. Burney hoped to use kerosine-cum-hydrogen engines, and thus eliminate gasoline, but it became clear that this new type required much more development and aero engines were installed at the cost of carrying many tons of gasoline in the hull. Bristol gas starters are used in each car, and two cars only have ordinary Acedes automobile engines to drive dynamos for electric current.

There is no method of shifting ballast about the ship by power as in R.101, and it is necessary for men to hand pump for 20 mi. every hour to fill the gravity service tanks over each engine car, whereas in R.101 this is done by power. The estimated performance figures show that with a total displacement of 156 tons a disposable lift of from 55 to 60 tons is available, according to atmospheric conditions, with a maximum speed of 80 m.p.h. and a cruising speed of 70 m.p.h. When carrying the passenger load of 100 there is available for fuel 26 tons, giving the following ranges under still air conditions: 5,000 mi. at 50 m.p.h.; 3,800 mi. at 60 m.p.h.; 3,000 mi. at 70 m.p.h.

The passenger accommodation is located in one bay of the ship and is on three floors, whereas that of R.101 is in two bays. The bottom floor is given up to the crew and the two upper ones are required for the passengers, the whole passenger coach being surrounded by a double wall through which air is circulated to isolate it from the rest of the airship. There is a central lounge, not as large as that of R.101, surrounded by berths and extending up the height of the two floors, with a gallery round the upper floor. Gangways between the berths give access to the promenade spaces with their glass panels in the ship's sides. These promenades are larger than those of R.100.

The central lounge is also the dining room, and the adjoining electric kitchen rather suggests that the smell of the food may be with the passengers even when meals are not being served. There is no smoking room, either, and it means that the passengers are more or less living in one room all the time. On R.101 there is the spacious main lounge, the separate dining room shut off from the rest of the ship and the small but much desired smoking room. R.101 has two berth cabins only, whereas R.100 has four berth carbins, and these appear more cramped than those of the other ship.

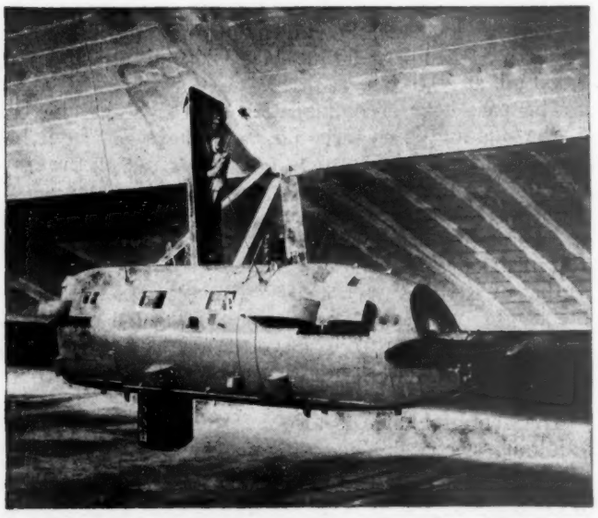
ANOTHER difference which appears to be in favor of R.101 is that its evaporative cooling system makes the equivalent heat of 1,000 hp. in one radiator available to warm the air circulated by a fan into the passenger quarters. R.100 depends upon electric radiators, and this means, of course, that the auxiliary power plant has a heavy load and probably that the air in the quarters will not circulate as rapidly.

Another important variation is in the form of construction of the main frames, which still retain the radial

bracing associated with Zeppelin construction. The loads in these, it is claimed, are halved by a central girder running the whole length of the ship along the axis but it still seems that with displacement of gas bags extra loads may come on the frames in a way which has been obviated in R.101 by the use of deep girder frames which are rigid without any radial bracing. On the other hand, R.100 has evidently gained in total gas content by this system for the total displacement is given at 156 tons as against 150 tons for R.101. The axial girder on the other hand, complicates the making of the gas bags, which have a central hole to permit the girder to pass through. However, this may render easier the actual introduction of the gas bag as it can be hoisted up on the girder which is then connected up on each side to the center point of the radial wires.

Triangular girders are used everywhere for main frames and longitudinals, but these, like R.101, have tubular booms with stamped lattice work connecting struts. The booms are rather ingenious as they are made from duralumin strip rolled up in a spiral to form a tube and then riveted along the seams. The whole operation is carried out in a special machine quite expediously, and this system has the advantage of permitting tubes of 5-in. diameter to be formed with control of the quality and strength of the metal used.

The three booms then are mounted in a jig and the lattice struts riveted into place, while each girder is finished off with a standard screwed socket made of solid



Showing how duty engineer descends air ladder from the ship to the engine gondola

duralumin. These connect at the junction with each ring with the special framework called a "spider," because it links up every girder both in frame and longitudinal. It has a corresponding screwed socket to line up with the longitudinals and actual connection is made by a right and left handed threaded duralumin collar so that the longitudinals come together much as the two ends of a turnbuckle. Naturally the particular angle of the doubled screwed socket varies with each frame and this allowance is provided for in the setting up of the spider in the jig. Another feature of the spider is that all bracing wires pass through the neutral axis, and are held there by being passed through a steel tube which grips the wires as one mass.

Standard end fittings are used throughout, and the whole construction has been most ingeniously thought-out to reduce the dissimilar parts in the ships to 42. There are not more than seven dissimilar parts in the whole of the longitudinal girders and only thirteen different parts in the construction of the transverse frames. Yet each girder is curved to give a proper continuous streamline shape and the design, it is stated, is such that all loads in girders are either pure compression or tension. Throughout the ship, too, a system of grading the girders and shear wires has been followed, the strength, and, therefore, the weight of each girder varying with the local strains in that particular area.

NATURALLY in the bow where the mooring strains are concentrated the girders are uniform and reinforced, but in the center bay the principal stresses are due to hogging loads (that is, the ship trying to hump its back). Here the lower longitudinal girders are stronger to resist compression than the topmost girders which have mainly to take loads in tension. The same principle applied throughout the ship has enabled material savings in weight to be made without, it is claimed, any loss of strength. The fins and tail planes are fixed to the hull by a new method by means of girders shaped like a cross, the center of which is a much strengthened axial girder, the whole being tied again to the spider webs.

These spider webs, in fact, are the vital members of the ship and upon these is hung, as it were, all the loads. The lift of the gas bags is taken to these, and the passenger accommodation again is taken to the spiders so that all localized strains in girders or frames are avoided. The control car and the engine nacelles, as in R.101, are the only projections from the ship, and a very low drag is expected.

There is another main difference between the two ships which is worth noting as it may be important from the viewpoint of production cost in future ships, and this is in the design of the rings. It is claimed for R.101 that as the ring is a self braced unit, it is possible to build it flat on the floor of the shed, mount all tanks, pipes and auxiliary apparatus in the ring economically at that point, and then merely hoist the ring up horizontally until it is high enough to allow it to swing vertically into position, whereas with the radially braced frame of R.100 this is not possible and most of the work must be completed after the ring is in position high up in the shed.

R.101 is undergoing modifications which the flight tests have shown are possible to increase the performance, the chief of these being an increase of gas bag capacity by reducing the clearance between the netting and the frame of the ship. This will add about four tons to the lift and with other alterations, it is extremely likely that R.101, despite the criticisms launched against her carrying capacity, may in the end have a surprisingly good performance. It must not be forgotten that whereas with gasoline engines, as in R.100, there is a definite drop in economy with the lower throttle openings, R.101 gains with her compression ignition engines as the fuel consumption is proportional to the throttle opening. The slower running airscrews of R.101 also help to propeller efficiency at the lower speeds, and it is almost certain that a higher percentage of power is converted into useful thrust in R.101 than in the case of R.100. Thus there may yet be surprises in store when the R. 101 comes out again in March, especially if a successful metal blade can be evolved to enable all engines to be used for forward movement, instead of one being reserved as now for astern purposes.

GENERAL NEWS

HERBERT F. POWELL, *News Editor*

HIGH POINTS in the NEWS

▶ *Victory to Curtiss.* Slotted, flapped, and floating-aileroned Tanager granted $100,000 grand prize in Guggenheim Safe Aircraft Competition, as Handley Page entry fails to pass minimum gliding speed requirement.

▶ *But.* Handley Page-Curtiss court action jells further, as latter answers $300,000 slot patent infringement suit brought by former by calling on nine-year-old injunction, first aimed at war surplus craft, to hold Handley Page plane.

▶ *Miami ready.* —For All American Air Meet scheduled at Florida city, Jan. 13-15.

▶ *And.* Eight-day tour of Florida airports by some two score planes follows Miami meet. Displays and races planned at St. Petersburg, Tampa, and Orlando stops.

▶ *Firms report '29 production.* Robins built totalled 562; Buffalo Curtiss plant made 233 planes, 914 engines; American Eagle gross sales up 15 per cent; Wichitans did $6,000,000 business.

▶ *Licensing uniformity lacking.* Federal licenses required in 32 states; 20 ask them for all, twelve ask them for commercial planes and fliers only. Six states require either state or federal licenses, six others ask state licenses only, eight states ask none at all.

▶ *Stately flying.* Budget of Governor Roosevelt, New York, calls for $16,000 appropriation for state plane. Satisfaction will mean more aircraft purchases later.

Airports and Airlines

▶ *Are you a Transport?* To be eligible for new Arrow firm school at Havelock, Neb., you must be. Airport and school managers will be trained.

▶ *Count Stout in.* New lowered rates on his lines bring $.075 per mile fare: Detroit-Chicago $18, Detroit-Cleveland $10.

▶ *Rio section ready.* New York, Rio & Buenos Aires Line to open Buenos Aires-Rio division of line Jan. 15.

Foreign

▶ *An anniversary.* Fokker Amsterdam Works observes passing of tenth year. Fokkers now used by 35 firms in 30 countries; they are built by eighteen factories in fourteen countries.

Tanager Wins Grand Prize In Safe Airplane Contest

MITCHEL FIELD (L.I., N.Y.)—The highest monetary reward and the strongest expression of professional approval has been granted to the Curtiss Aeroplane & Motor Corp., entry, the "Tanager," in the Guggenheim Safe Aircraft Competition, with the formal award of the $100,000 grand prize.

Award of the prize was made here Monday, Jan. 6, in the presence of members of the Guggenheim board and aviation experts, headed by Capt. E. S. Land, vice-president of the Fund and its active head in the absence of Harry F. Guggenheim, Ambassador to Cuba.

But fifteen of the 27 entries making reservations for the contest appeared at Mitchel Field tests, and the British entry, the Handley Page proved the Tanager's only serious rival. The English entry passed practically all of the qualifying tests but failed to obtain the minimum gliding speed of 38 m.p.h., as called for by the rules. The best this craft could do was 39.7 m.p.h. The judges also stated that in the various conditions of trim and rig the Handley Page performance was open to reasonable doubt as to exact compliance with the requirements of "general stability" and "recovery from violent disturbances."

A Tribute to Osborn

As the Tanager was the only entry to pass all the qualifying requirements, it was not necessary to hold the final competitive tests which were originally planned to ascertain the winner on a point basis, under identical weather and field conditions.

The passing of eighteen qualifying tests by the not unusually radical Challenger-powered Tanager, is generally regarded as a high tribute to Curtiss engineers and in particular to Robert R. Osborn, the one most responsible for the design.

Wing slots were placed on the Tanager along both upper and lower wings, and the trailing edges of both wings were equipped with flaps. These flaps were controlled by a crank operated from the pilot's cockpit. Especially striking were the ailerons, of full floating type, which were placed at the tips of the lower wings. The plane has a span of 44 ft. and a constant chord of 5 ft.

It is reported that the Curtiss company intends producing commercial craft with Tanager features.

Judges Named

Judges for the competition were Orville Wright, chairman; F. Trubee Davison, Assistant Secretary of War for Aeronautics; William P. MacCracken, Jr., former Assistant Secretary of Commerce for Aeronautics; Edward P. Warner, editor of AVIATION and former Assistant Secretary of the Navy for Aeronautics; Dr. George W. Lewis, director of the National Advisory Committee for Aeronautics; and Rear Adm. Richard E. Byrd, Jr. The technical advisers were Prof. Alexander Klemin, of New York University; Capt. E. E. Aldrin, of the Aviation Division of the Standard Oil Co. of New Jersey; and Maj. R. H. Mayo, representative of the Guggenheim aeronautical fund in England.

The tests in the competition were started at Mitchel Field in June, 1929, and were conducted by the Fund's pilots, Thomas Carroll, formerly N.A.C.A. test pilot, Edward W. Rounds, Navy test pilot, and Lieut. Stanley Umstead, Army test pilot at Mitchel Field. The Field Manager of the competition was Capt. Walter Bender, Army Air Corps.

(Concluded on page 70)

Robert R. Osborn indicating one of the Tanager's floating ailerons.

Tanager Wins $100,000 Guggenheim Prize

(*Concluded from page* 69)

Of the fifteen planes which were presented at Mitchel Field, six withdrew: namely, Heraclio Alfaro; Gates Aircraft Corp.; Command-Aire, Inc.; Schroeder-Wentworth Co.; Bourdon Aircraft Corp. and the Moth Aircraft Corp. Six others, namely, Handley Page, Ltd.; Taylor Brothers Aircraft Corp.; Fleet Aircraft, Inc.; Cunningham-Hall Aircraft Corp.; Ford-Leigh Safety Wing, Inc.; and Brunner-Winkle Aircraft Corp., failed to meet requirements of the competition. The entry of V. J. Burnelli failed to arrive at Mitchel Field within the specified time limit, even after this was extended. It was automatically eliminated. The entry of J. S. McDonnell, Jr. and Associates was damaged in a test flight while being flown by Mr. McDonnell before being turned over to the Fund's test pilots and was not resubmitted to the Fund prior to the conclusion of the competition.

The following were the tests which the Curtiss plane successfully passed:

1. The aircraft must maintain level and controlled flight at a speed not greater than 35 m.p.h. and must be able to glide for 3 min. with all power switched off at a speed not to exceed 38 m.p.h., the demonstration glide being of at least 3 min. duration.

2. The aircraft must come to a complete stop within 100 ft. of the spot where it first touches the ground in landing.

3. A steady glide must be made over an obstruction 35 ft. high and the aircraft must come to a complete stop within 300 ft. of the base of the obstruction. This is to test the plane's ability to make a forced landing in a small space surrounding by wires, houses or trees.

4. The aircraft must take off after not more than a 300-ft. start along the ground and must then clear a 35-ft. high obstruction 500 ft. from the starting point.

5. To test its ability to approach an uncertain landing place in event of engine failure, the aircraft, with all power switched off, must glide at an angle of not more than 8 deg. to the horizon; and must also be able to glide at an angle of more than 12 deg. to the horizon at a speed not greater than 45 m.p.h.

6. In normal flight, at a speed of 45 to 100 m.p.h., the pilot must take both hands off the controls, leaving them entirely free for at least 5 min. to demonstrate the ability of his craft to right itself after disturbances from wind gusts or from the application of controls.

7. The aircraft must show that if the engine suddenly fails on a steep climb, no abnormal attitude such as a stall followed by a nose dive, will result and that the craft will descend on a steady easy glide without intervention by the pilot. A frequent error following engine failure is the pilot's tendency to pull back on his controls instead of nosing down the craft into a glide. The aircraft must demonstrate that it is fool proof against such an error, and one of the tests requires that the power shall be switched off on the climb, the elevator control pulled back towards its maximum extent, and that the craft shall, under such conditions, descend on a steep glide at a speed of not more than 40 m.p.h. and under perfect control.

8. The plane must be provided with three controls, which are independently effective about corresponding axes of the aircraft at all altitudes.

9. The aircraft must show its ability to take off and to land on a plot 500 ft. square surrounded by a 25-ft. obstruction. To test this properly a portion of the field will be marked off, and four observers placed 25 ft. above the ground will sight across the boundaries of the plot. After the craft has left the ground, the observer will switch off the engine when he pleases, and the pilot will land the craft within the square without passing through the imaginary obstruction. The test will demonstrate the ability of the craft to use restricted territory with bad approaches. The aircraft must be able to taxi under its own power in any direction in a wind whose mean speed is at least 20 m.p.h.

By way of explanation concerning the change in the gliding test requirement, the Guggenheim Fund has made public the following information:

"Safe Aircraft Competition rules, Appendix III, page 14, paragraph 5 (b) is quoted as follows:

"Steepest Glide: The aircraft shall be able to glide with all power switched off so that the angle between the flight path and the horizontal is not less than 16 deg. During this test the air speed shall not exceed 45 m.p.h. In both cases the aircraft must demonstrate that all the controls are definitely effective throughout the test, and that it can land safely out of this glide from a useful altitude."

Repeated tests and demonstrations on the best planes in the Competition, as well as other planes, have definitely shown that this requirement of 16 deg. is practically impossible of attainment *under the conditions laid down in the Rules.*

Page 2 of the Rules contains the following under paragraph 2:

"Qualifying Requirements: Every aircraft whose entry for the Competition has been duly accepted will be called upon to demonstrate that it satisfies all the qualifying requirements which are prescribed in Appendix II. In the case of an aircraft which departs radically from conventional practice in securing flight, the Committee of Judges may substitute for those requirements that are impossible of attainment, other tests that will satisfy the object of the Competition."

On Nov. 29, a conference of all Technical Advisers, all pilots, all observers, the Field Manager and the Vice-President of the Fund was held at Mitchel Field and it was unanimously recommended that paragraph 5 (b) be modified by substituting "12 deg." for "16 deg." in this paragraph.

This action was taken after full discussion of all matters relating to the rules, their inception, their preparation, their intent and their purpose. The matter was referred by mail ballot to the Judges and tentatively approved.

On Dec. 28, at a conference of officials of the Safe Aircraft Competition including all Judges who could possibly be present, representing a majority thereof, the action of the conference of Nov. 29 was approved. The best result obtained in the steep glide tests by any entry was about 14 deg. This result was obtained by both the Handley-Page and the Curtiss entry, the results being the same for both entries.

Why Get Skis? Asks Mr. Rhodes

EVELETH (MINN.)—The other evening, C. E. Rhodes, of Kingston-Rhodes Airways here, sought his bed amid dreams and reverie of fair California weather. He was "all set" to take off for the Coast state on the morrow in one of the firm's pontooned Ryan Broughams.

But at dawn he awoke to find his plane frozen fast in a substantial coat of ice which had formed over the lake as a result of a sudden cold snap in the night. Exit the dreams? No, not this time....

Undaunted—as they would say of certain fiction characters—Rhodes dug his Brougham out, used his pontoons *a la* ski, and took off for California!

Curtiss, Handley Page In Aircraft Patent Tangle

NEW YORK (N. Y.)—In answer to the $300,000 damage suit brought by Sir Frederick Handley Page against Curtiss Aeroplane & Motor Co. for alleged infringement of his patents by the use of wing slots on the Curtiss "Tanager," the latter company has obtained an injunction which will hold the Handley Page entry in the Guggenheim Contest in this country, and in addition a court order asking the British manufacturer to show cause why he should not be adjudged in contempt of court for bringing his plane into this country.

In 1921, Aircraft Disposal Co., Ltd., was formed as a subsidiary of the Handley Page company, presumably for the purpose of dumping war surplus planes on the American market. At that time, the Curtiss company claimed that Handley Page had infringed various Curtiss patents, and on this basis obtained a permanent order to enjoin Sir Frederick Handley Page and his associates "henceforth and forever . . . from bringing an airplane of their company into the territories of the United States." It is this order which the British firm is said to have violated, and accordingly papers were served on Maj. James F. Cordes, Handley Page contest pilot, at the Guggenheim hangar, Jan. 4.

A suit to settle the international status of aircraft patents has been expected for some time, and it is hoped that the present actions will help to clarify the situation. The disagreement is further complicated by the fact that Dr. Alfred Leigh, Chilean inventor, has charged that the Handley Page slots in question infringe patents which he obtained about ten years ago. The British point to the fact that the U. S. Navy paid the Handley Page company $250,000 for the right to use the slots on military planes.

Officials of the Curtiss company maintain that their slots are a result of special development by their own engineers and that in any case no patent infringement could have occurred inasmuch as the Tanager was purely experimental and not intended for commercial production at present.

Asks Cessna Firm Receiver

WICHITA (KAN.)—F. M. Munoz, a stockholder, has filed a petition in the district court here asking that a receiver be appointed to direct the affairs of the Cessna Aircraft Co. In his petition, Munoz, who holds seven shares of stock, blames mismanagement as the reason for failure of the firm to show profits. The company, he says, sold $750,000 worth of planes and more than $300,000 worth of stock in 1929 but finished the year $100,000 in the red. No intimation of bankruptcy is set forth, but the petition states that there are oustanding debts that should be met by the company.

Curtiss Company Tests Prestone-Cooled Falcon

BUFFALO (N. Y.)—The first airplane with a Prestone cooled engine to be built in Buffalo production was recently put on engine test in the Kail Street plant of the Curtiss Aeroplane & Motor Co. The building of the new plane known as the O-1-E has been kept secret and its test was private.

The new plane is significant for its reduction of radiator space and the addition of two small circular radiators just above and to the right and left of the propeller. The plane is an adaptation of the Curtiss Falcon series of observation planes of which a small quantity for experimental purposes are going into the hands of the Army Air Corps.

Curtiss engineers in experimenting discovered that on account of the higher maximum temperature of the cooling liquid, that it was not as good a medium for cooling circulating oil as water. This accounts for the devices on the nose resembling eyes through which oil circulates and cool air flows when the airplane is speeding. The oil, consequently, is separately air-cooled. The O-1-E is powered by a direct drive Curtiss Conqueror engine.

Experimentation is also reported on a method whereby the radiator could be wholly done away with through cooling of the Prestone in the water jackets of the engine itself. Arthur Nutt, chief power plant engineer, is directing the experimentation.

Leaders Will Address S.A.E. at Miami Meeting

MIAMI (FLA.)—This city is to be the scene of the first Southern Aeronautical Meeting of the Society of Automotive Engineers, with three papers by aero leaders scheduled for Tuesday evening, Jan. 14, at the Columbus Hotel. The All American Air Meet will be under way here at the time, extending from Jan. 13-15. Lieut. Carl B. Harper, U.S.N., will act as chairman of the meeting.

Authors and their papers are as follows: J. M. Eaton, general traffic manager, Pan American Airways, Inc., "The Important Part Played by Equipment and Operations in the Financial Success of an International Airline"; Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, "Problems of International Flying"; William B. Stout, president, Stout Air Services, Inc., "Aviation and Foreign Relations."

Hangar Iron to Japan

MASSILLON (OHIO)—The Central Alloy Steel Corp., soon to become a part of the newly formed Republic Steel Corp., has received a large order from Japan for galvanized Toncan sheets to be used in the construction of new hanggars for the Tateyama Naval Air Corps.

Nose of the New Falcon

Two More Planes Approved

WASHINGTON (D. C.)—Two more airplanes have lately been approved here. They are No. 284—Lincoln PT Warner, two-place open biplane, Warner engine, weight empty 1,203 lb., useful load 591 lb., gross 1,794; and No. 286—Spartan C-3-225, three-place open biplane, J6-7, weight empty 1,741 lb., useful load 959 lb., and gross 2,700 lb.

Announce Several Miami Race Entries

MIAMI (FLA.)—Final arrangements are being completed here for the All American Air Meet opening Monday, Jan. 13. Among the entries which have been received are the following:

Ed Hedeen, Racine, Wis., Whirlwind Waco; Larry D. Ruch, Kansas City, Kan., American Eagle; S. R. Ross, Akron, Ohio, Lockheed Vega; Errett Williams, Greenville, S. C., Eaglerock Bullet; Dr. Ralph S. Green, Jacksonville, Fla., Waco 10; Wedell-Williams Air Service, New Orleans, La., special racing plane; Verne D. Christen, Alliance, Ohio, Eaglerock; Park P. Reed, Haverford, Pa., Waco 10; Sydnor Hall, St. Louis, Mo., Travel Air; John F. Gill, Hapeville, Ga., Travel Air; Coral S. Babcock, L. W. Stacey, and H. C. Mueller, Orlando, Fla., Wacos; Charles E. Arnold, Hapeville, Ga., Travel Air; Freddie Lund, Troy, Ohio, Waco Taperwing; Charles F. Hirsh, Philadelphia, Pa., Monocoupe; Art Davis, Melbourne, Fla., Waco; Harry Hughes, Melbourne, Fla., KR Challenger; Don Dice, Standard Oil of Louisiana, Keystone-Loening; Clarke L. Smith, Philadelphia, Waco; William F. Millar, Peterboro, Can., Moth; Malcolm Mathewson, Detroit, Argo; Evelyn Mathewson, Detroit, Stinson Junior; Helen Cox, Greensburg, Pa., Waco or Avian; Frank E. Bowles, Riverside, R. I.; and Dick C. Holihan, Flint, Mich. Several Army, Navy, and Marine Corps planes are also scheduled to partake in the event.

Tour of Florida Follows Air Meet

Plan Several Shows And Races at Stopovers

MIAMI (FLA.)—Florida's airmindedness is expected to be stimulated through the Florida Statewide Air Tour, scheduled to be conducted Jan. 16-23, inclusive, immediately following the All American Air Meet to be held here Jan. 13-15. The Tour, which has been sponsored by the Aviation Committee of the State Chamber of Commerce and sanctioned by the N.A.A., starts from Miami and terminates at Jacksonville following an eight-day tour of the state airports.

Governor Carlton, Carl G. Fisher, Mayor of Miami, Maj. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, George Haldeman, of the Bellanca Aircraft Corp., and Freddie Lund, of the Waco firm, are expected to be among the participants.

The tentative plans provide for airplane shows and air meets with substantial prizes at St. Petersburg, Tampa, and Orlando, with visits to a number of other cities interested in aviation where the public will be given the opportunity to inspect the planes making the tour. Overnight stops will be made at Sebring, St. Petersburg, Tampa, Orlando, and Winter Haven, with other organized stops to be announced later. A program of entertainment is being arranged for the participants.

Plans contemplated include visits to Sarasota, Lakeland, Daytona, St. Augustine, Daytona Beach, Gainesville, Tallahassee, and Lake City, in addition to stops previously mentioned.

Expect 40 Craft

Forty aircraft are expected to take part in the journey, according to Bob C. Smalley, who has been named manager. Two Goodyear Zeppelin firm dirigibles, now stationed at Miami and St. Petersburg, are to be included, he states. It is also announced that the fleet will assist St. Petersburg in a ceremony honoring the sixteenth anniversary of what is termed the first commercial airline operated on a regular schedule. This was begun by pilot Tony Janus in January, 1914, flights being made between Tampa and St. Petersburg.

Headquarters for the Tour are being maintained at 421, Central National Bank Building, St. Petersburg. Andrew H. Heermance, director of aviation at Miami, is chairman. Maj. Luke Christopher, Contest Committee of the N.A.A., will have control of the contestants.

Makes 1930 Plane Contract

OAKLAND (CALIF.)—D. C. Warren Co., this city, has contracted with the Curtiss-Wright Sales Corp. for $500,000 worth of planes in 1930. Warren is Travel Air distributor for Northern California and Nevada.

Army Pursuit Group In Mimic War Flight

Radio Station in Airplane Making Short Wave Tests

WASHINGTON (D. C.)—In order to test the efficiency of planes, personnel, and equipment under winter conditions, the First Pursuit Group of the Army Air Corps has organized an "Arctic Patrol," which began its maneuvers on Jan. 8 under the command of Maj. Ralph Royce. The expedition, consisting of eighteen pursuit planes and two tri-engined transports, equipped with skis instead of the usual landing gear, took off from Selfridge Field, Mich., to engage in mimic warfare for eight days under sub-arctic conditions over the 3,500-mi. "battle front" stretching between Detroit and Spokane.

The flight's itinerary includes stops at St. Ignace, Mich., Duluth, Minn., Grand Forks, N. D., Minot, N. D., Glasgow, Mont., Great Falls, Mont., Kalispell, Mont., and Spokane, Wash. The route back from Spokane lies by way of Helena, Mont., Miles City, Mont., Bismarck, N. D., Fargo, N. D., Minneapolis, Minn., Wausau, Wis., Escanaba, Mich., to Selfridge Field, Mich.

Wireless Network in Operation

A secondary object of the expedition is to obtain first-hand experience as to the value of short-wave radio in connection with Army Air Corps operations in remote sections and covering long distances. Therefore, in conjunction with the "Arctic Patrol," station AB6 installed in one of the accompanying Army transports inaugurated a series of short-wave communication experiments with the craft in flight as well as on the ground. The radio plane operates on wave-lengths of 32.5 m. and 54 m.

The tests being made involve the coöperation of the Army radio network, the members of the American Radio Relay League, and station W2XK, the experimental laboratories of the General Electric Co. at Schenectady, N. Y., and consist of maintaining constant communication during flight hours with the Army Signal Corps network.

St. Louis Men Back Show

ST. LOUIS (MO.)—A committee of more than 175 St. Louisans prominent in business, industry, and the professions, and including many city officials, has been organized by the St. Louis Chamber of Commerce Air Board to coöperate with officials of the Aeronautical Chamber of Comgmerce in staging the International Aircraft Exposition, Feb. 15-23. The committee will be known as the St. Louis Committee on the International Aircraft Show. It was formed by the organization committee of the Air Board, headed by Harold M. Bixby, who aided materially in bringing the exposition to St. Louis.

Waco is Flown With Auto Engine

DAYTON (OHIO)—Though Franklin-powered Wacos are not expected to become commonplace, at least it may be said in aeronautical history that there was such a thing.

The other day, a Franklin Sedan was driven into a hangar at Johnson airport here and its new air-cooled engine was removed and refitted in the nose of a Waco. A pilot then proceeded to fly the plane.

[We know that Franklin advertisements are now going to tell us all about the automobile power plant that successfully flew an airplane—but, Mr. Brukner, what do you think all this proves?—Ed.]

Open Spartan Branch at Dallas

DALLAS (TEX.) — Spartan Aircraft Corp., Tulsa, Okla., has opened a branch factory and distributing office at Love Field, here. Capt. Dave Wiegel is in charge with offices in the Good & Foster hangar. A display room of Spartan planes will be maintained at Love Field.

Pratt & Whitney Moving Machinery to New Factory

HARTFORD (CONN.)—The Pratt & Whitney Aircraft Co. is now moving its machinery from the old plant on Capitol Avenue, Hartford, to the new buildings being completed in East Hartford. The company has undertaken the task of making the shift on its flatcars, having laid spur tracks to both factories. The Chance Vought Corp. will in February or March move its entire equipment, accompanied by some 500 employees and their families, from Long Island City, N. Y., to the new $1,000,000 plant in East Hartford. Work on the new plant is being pushed as rapidly as possible, and it is slightly more than three-quarters completed.

According to Charles N. Liqued, aeronautical consultant in charge of the East Hartford building operations, it will be necessary for Vought to vacate the Long Island City plant Feb. 1, and in spite of the bad weather which has hampered to a great extent the building, it is hoped that the company may start in production immediately in the new factory. The moving will be done by train and trucks, and will be done in such a way as not to hold up the orders now in production. Officials say about ten days will be required to move the machinery and personnel to East Hartford.

Thirty Planes Listed For N. Y. Legion Show

NEW YORK (N. Y.)—Rex F. Gilmartin, Commander of Aviators' Post 743, American Legion, under whose auspices the Second Annual New York Aviation Show is to be held at Grand Central Palace here, Feb. 7-15, announces that 30 planes are already listed for exhibition in the show.

Featured among the planes to be entered is the new all-metal eighteen-passenger Burnelli monoplane which will be shown to the public for the first time. Three gliders, one of them motored, will be shown by the American Motorless Aviation Co., and Baron Koenig von Warthaussen will bring from Germany his Klemm-Daimler with which he toured the world.

A statement issued last week lists the following entries:

Burnelli Safety Monoplane, Aeromarine Klemm Land Plane, Aeromarine Klemm Amphibion, Twentieth Century Plane, Bird Biplane (large), Bird Biplane (small), Liore et Olivier seaplane, Barling NB-3, Camel, Nieuport, R S V monoplane, R S V biplane, Air Cub, Air-Istocrat, Klemm-Daimler, American Eagle, Bellanca "Pathfinder," Eaglerock, Eastman, Fleet, Great Lakes, Savoia-Marchetti, Stearman, Flying Dutchman, Travel Air, Moth, Arrow Sport, Great Lakes, Waco, New Standard. Accessories—Buhl Stamping Co., Harwen Products Co., Szekely Motor Co., Richfield Oil Corp. of New York, Paramount Welded Aluminum, Selley Mfg. Co., Westinghouse Elec., Robert Bosch Magneto, National Aero Corp., Claude Neon Lights, Inc., Airport Lighting, Inc., Estey Reid Aircraft, Indian Motorcycle Co., Clersite Company, Metropolitan Harley Davidson, Aero Supply & Mfg. Co., Cunan Machine Works, W. J. Savage Co., The Hoover Co., E. S. Ritchie & Sons, Triplex Safety Glass Co., Pyrene Manufacturing Co., Fleischmann Trans. Co., Walker Cement Products, Whittemore-Sim Co., Inc., Sidney Blumenthal Co., Pittsburgh Plate Glass Co., F. E. Nevins, I. Chertok, Sail-Me Co., Inc., Grant Aircraft Co., Ideal Aeroplane & Supply Co., J. P. Dart, The Martin-Rosebury Corp., Zolton H. Polachek, Geo. D. Wanner & Co., The Caddo Co., Inc., O. D. Patents Corp., I. W. Barnard, Mackinnon Fly Pub., Inc.

Wichita Firms Report $6,000,000 Trade in '29

WICHITA (KAN.)—Planes valued in total at $6,000,000 have been sold and delivered during the past year by Wichita aircraft manufacturers, according to figures reported here by the several firms.

Travel Air leads the list with $3,500,000 worth of monoplanes and biplanes sold during 1929. The 1928 production figure was doubled.

Stearman Aircraft follows with $1,000,000 worth of planes sold during the period, an increase of $100,000 over 1928. Several new planes were developed by the company during the year.

Swallow officials report business totaling $560,000, an increase of 15 per cent over 1928. Cessna Aircraft built more than $500,000 worth of monoplanes despite the fact that much time was required in moving to the new plant at the municipal airport.

Several new companies here each built from one to four experimental planes during 1929. The value of these is placed at $150,000.

Field, School Managers To be Trained by Arrow

HAVELOCK (NEB.) — Arrangement has been completed at Arrow Airport, Inc., for the new Arrow School for airport and flying school managers, and instruction will get under way shortly. James Fisher, manager of Arrow Airport and Arrow Flying School, subsidiaries of the Arrow Aircraft & Motors Corp., will be in charge.

A rigid examination, it is stated, will be given all applicants for admission to the new school, with personal appearance, education and ability being stressed. Students accepted must have a transport license and mechanic's license, although applicants may be admitted without the latter, providing they have had sufficient experience to enable them to qualify for it within not more than four weeks pre-instruction.

The school will include courses in student training, airplane mechanics and maintenance, engine mechanics, business administration as applied to airport and flying school management, and accountancy. Graduates will be supplied with flying school supplies such as prepared lectures and blueprints, and the complete course will be given for $250.

State of New York Will Purchase Plane

ALBANY (N.Y.)—The State of New York is to have an airplane of its own, according to State Senator J. Griswold Webb, chairman of the New York State Aviation Commission. Senator Webb stated that an item of $16,000 is included in the Governor's budget for the purchase of a plane to carry two pilots and four passengers and which will be owned by the State and operated by National Guard aviators. The home quarters of the plane when purchased will be at Miller Field, Staten Island, and civilians may be carried in it. The State of New York at present has no airplanes of its own. If this initial purchase proves satisfactory, further appropriations will probably add other craft in future years.

Other state legislative activity includes a bill, now in preparation, which would regulate state aviation schools by granting the state authority to license and inspect aero institutions and to revoke licenses in certain instances. The main object of such a measure, it is stated, would be to standardize, so far as is practicable, the methods of teaching aviation, and to protect the public.

Knoll Plant Sale Postponed

WICHITA (KAN.)—The district court here granted postponement of action on the sale of the property of the Knoll Aircraft Co. when James B. Woods, receiver, said the highest bid he had received was $73,000. Mr. Woods believes he can obtain more. The factory building alone cost $89,000, it was testified, and there is machinery and 149 acres of land in addition.

Wright Acquires Engine Design

NEW YORK (N. Y.)—Blueprints of a new engine designed by Alfred Schwarz, consulting engineer of the Holloyt Motor Corp., of New York, and president of the Wing Aeronautical Corp., have been acquired by the Wright Aeronautical Corp., Paterson, N. J., for a period of a year, during which time experimentation will be carried on. Greater combustion efficiency is claimed for the new plant, which it is stated will be an air-cooled radial of seven or nine cylinders. The development of the new design was under the auspices of the Federal Research Corp. and a syndicate headed by G. V. Hollins, member of C. D. Halsey & Co., of New York City.

Electric Generator Designed for Airships

AKRON (OHIO) — Goodyear Zeppelin Corp., this city, announces the development of an electric generating equipment for airships of the non-rigid type, capable of an output of 350 watts at 110 volts, which weighs but 125 lb. complete.

The equipment consists of a one-cylinder, four-cycle air-cooled gas engine mounted together with a rugged but light generator on a metal base. The generator was designed to provide a portable means of supplying electrical energy for lighting lighter-than-air craft while moored on unlighted airports and to facilitate landings on unlighted fields.

A moored airship can be lighted up at night with this equipment, guarding against the possibility of other aircraft colliding with it and at the same time providing ample light for members of the ground crew to do their work.

Goodyear Zeppelin's New Generator

In flight, the generator unit will provide a dependable source of energy for navigation lights and other electrical apparatus. For night landings on unlighted airports, a pair of flood lights mounted under the control cabin of the ship can be operated with the generator to light up a large area.

Extensive experiments with the new apparatus will be conducted with the Goodyear airship "Defender" this winter, while it is stationed at Miami, Fla.

Aero Branch Stresses Uniform Licensing Need

WASHINGTON (D. C.)—There is imperative need for uniformity throughout the United States in the matter of regulating airworthiness of aircraft, competency of airmen, and the operation of aircraft in the air, a statement issued recently by the Aeronautics Branch points out.

At present, federal licenses are required for aircraft and airmen in 32 states. Twenty states require federal licenses for all aircraft and airmen, twelve require such licenses for aircraft and aviators engaged in commercial flying only, and six require either state or federal licenses. Six states stipulate that only state licenses shall be held by aircraft and aviators, while eight states require no licenses of any kind.

Under the provisions of the Air Commerce Act, the Department of Commerce can impose licensing requirements only upon aircraft and airmen engaged in interstate air commerce. It can, and does, however, extend the licensing privileges to intrastate owners and operators, the majority of whom, it is found, voluntarily apply for licenses. There remains, however, a class of airmen and aircraft who may operate without licenses so long as they confine their operations to the borders of states in which there are no limiting laws.

"There are, apparently, several ways in which the required uniformity may be accomplished," the statement continues. "The simplest seems to be the enactment of a state law which would, in its effect, require all intrastate aircraft and airmen to be federally licensed." This obviates the necessity of a state inspection system, though local enforcement of penalties for violations has usually been found desirable.

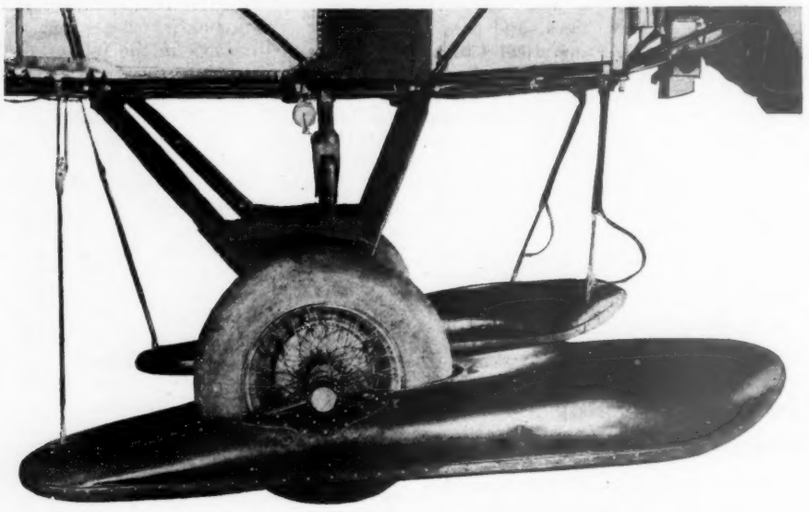
Division Thought Impractical

An alternative method is to provide for either state or federal licensing, while making the former identical in its requirements with the latter. At first blush, this plan might seem to be equally satisfactory, since it would seem likely that the federal licenses, being broader in scope and permitting interstate operation, would in all cases be preferred, and no actual state licensing system would be called for. Experience does not bear out this assumption, however. The state, as a matter of fact, must be at least prepared to issue licenses, and doubtless would be applied to by individuals who had failed to meet federal requirements. Thus, the state would find itself burdened.

Models to Advertise Lockheed

DETROIT (MICH.)—Detroit Aircraft Corp. is constructing approximately 1,500,000 replicas of the Lockheed Air Express to be placed in toy departments of stores throughout the country as a means of advertising the plane.

New Winter Flying Carriage Tested by Boeing



CALLED "SNOWPHIBIONS," the ski-wheel undercarriage devise shown above is expected to materially expedite Boeing mail-passenger plane traffic on the Chicago-Oakland-San Francisco route, according to K. K. Knickerbocker, Chicago Boeing representative. Tests are now being made on the attachments, which are designed to enable mail planes to land on either ground or snow.

It is stated that this is the first time a ski has been developed strong enough to be of service to a plane as large as the Boeing tri-engined transport. A small ski, incidentally, is also attached to the tail skid.

The "Snowphibion", constructed of dural and steel, is shaped to offer as little extra head resistance as possible, and in appearance is similar to a pontoon. The landing wheel projects through a center slot, as shown in the illustration above.

NEW PLANES

Olesen Aircraft, Inc., Bridgeport, Conn., is building a low-wing monoplane of all-metal construction, which will carry the Brownback 90 hp. plant. Goodyear Airwheels are to be included in the equipment.

Waterbury Button Co., Waterbury, Conn., has an experimental plane under construction. No details are as yet available.

Cadillac Aircraft Corp., Detroit, Mich., has begun work on a new twin-engined plane. The firm's McCarroll Duoplane "Voyageur," it will be recalled, was exhibited at the Cleveland show.

Final Department of Commerce tests are being arranged for the three-place open low-wing monoplane "Skylark" brought out at Wichita by the Watkins Aircraft Co.

The new Kinner-powered Mooney low-wing, four-place monoplane recently completed at Wichita by A. W. Mooney, was flown to Oklahoma City a short time ago with pilot and two passengers. A low operating cost was reported.

At Portland, Ore., success is reported to have marked the first test flight of Vance Breese' new J6-9 powered mail monoplane. The craft has a special center section designed to increase visibility.

Work is being rushed at New Brunswick, N. J., to complete a special plane which Willard van Buren King, of Morristown, N. J., plans to fly in the All-American Air Meet, Miami, Fla., Jan. 13-15. Designed by Frank Seesock, the plane is being constructed at the United States Aircraft Corp. plant, New Brunswick. The craft is a single-place low-wing monoplane with Scarab power. Wing covering is plywood; the span is 24 ft. and chord 38 in. A 13 gal. fuel tank will be installed for racing, while arrangements are being made for the installation of a 47 gal. auxiliary tank for general flying.

Wichita School Reports Record

WICHITA (KAN.)—A report covering four years of operations shows that Wichita Flying School planes have flown 664,650 mi. without injury to passenger or student and have covered 196,000 mi. in cross-country work with a total of 7,385 flying hours. The company has carried 7,632 pay passengers and has graduated 300 students in the period mentioned. In 1929 the company graduated 67 Limited Commercial, 52 Private, and nine Transport pilots, all of whom obtained their licenses.

American Eagle Firm's 1929 Progress Reported

KANSAS CITY (KAN.)—An expansion program that resulted in a 15 per cent increase in gross sales, enlargement of factory facilities, expansion of its sales organization and the acquisition of new units all are shown in the annual report of the American Eagle Aircraft Corp. for 1929, just made public by E. E. Porterfield, Jr., president.

Comparative figures are cited by Mr. Porterfield in his statement. "Our business in July, 1929," Mr. Porterfield asserts, "was $60,582 better than the same month in 1928. August, 1929, was $20,875 better than August, 1928. The increase in September was $27,737 and in October $49,206." The figures were cited as showing the general trend in the company's growth.

D. L. Chick, treasurer, stated there also had been a substantial increase in the parts and reconditioning business of the company. The figure for 1929 was approximately $116,677 against $97,470 for the previous year. During 1929 American Eagle built a $250,000 factory at Fairfax Airport.

Three Branches Organized

As a part of a reorganization program last year, Porterfield Aviation Interests, Inc., was formed within the American Eagle organization, its purpose being to provide a holding company for aircraft and aeronautical accessory concerns that American Eagle might desire to purchase and consolidate with its own company. The first of such firms to be acquired was the Wallace Aircraft Co. of Chicago, builder of the Wallace Touroplane, a three place folding-wing cabin monoplane.

The sales expansion included the formation of three branches incorporated under the states wherein they are located. These bases are situated at Wold-Chamberlain Field, Minneapolis; Love Field, Dallas, Tex.; and at the Grand Central Air Terminal, Glendale, Calif. D. H. Hollowell is the sales manager of the company.

American Eagle during the year exhibited planes at all the principal shows throughout the country. A good will tour was conducted by the company in which five planes visited more than 300 airports in all parts of the United States.

Engines Approved Total 36

WASHINGTON (D. C.)—Engines approved now total 36, according to recent announcements here. The last five of these are as follows: No. 32—Continental A-70, 7 cyl. radial air-cooled, 165 hp. at 2,000 r.p.m.; No. 33—Brownback C-400, 6 cyl. radial air-cooled, 90 hp. at 1,700 r.p.m.; No. 34—Kimball Beetle K, 7 cyl. radial air-cooled, 120 hp. at 1,850 r.p.m.; No. 35—Chevrolet Chevolair D-4, 4 cyl. in-line inverted, air-cooled, 90 hp. at 2,000 r.p.m.; and No. 36—General Airmotors Moore, 5 cyl. radial air-cooled, 120 hp. at 1,600 r.p.m.

Keys Tells of Curtiss Buffalo Plant Production

BUFFALO (N. Y.)—The demand for the products of the aeronautical industry will continue about as it has been, but the more conservative elements in the industry will take care to limit their production to equipment for which a definite immediate demand exists. Thus did C. Roy Keys, vice-president of the Curtiss Aeroplane & Motor Co. in charge of the Buffalo plant, sum up his expectations for the coming year in a statement made here recently.

Reviewing the situation during the past year, Mr. Keys pointed out that the beginning of 1929 found the aeronautical manufacturers generally with their production greatly oversold. There was a very definite volume demand for airplanes and engines for the equipping of commercial operations in training schools, transport lines, and for the sport trade. Considerable export demand existed also. Much of this was practically a new demand and tended to give a mistaken impression as to the continuous buying power of the industry as a whole.

Overproduction Menaces Retail Sales

"The greatest rate of buying occurred in March, 1929, and the greatest volume of production was probably in the middle of this past summer. This has now tapered off in what perhaps may be an annual decline."

At the beginning of last year, Mr. Keys continued, the industry was in the unhealthy condition of being able to market, without effort, everything it could produce. Now, on the other hand, "there are few if any companies that have not substantial manufactured inventories of planes which returned from a market in which, in my opinion, no real selling was attempted. That inventory has to be absorbed, though some of it will, perhaps, not be absorbed; but most of it will undoubtedly be sold cheap and interfere with retail sales for perhaps a couple of years."

More careful planning before placing orders and the application of sound salesmanship methods are important needs of the industry, Mr. Keys asserted.

Built 233 Planes, 914 Engines

"In January, 1929, there was produced at the Buffalo factories of the Curtiss Aeroplane & Motor Co. a total of 25 water-cooled engines and 29 air-cooled engines, or 54 engines all together. During that same month there were seven aeroplanes of various types built at the Buffalo plant. During May, 1929, which was the peak month for motors during the year, there were 48 water cooled and 75 air-cooled engines produced, or a total of 123 engines; and in August, the peak month for aeroplane manufacture, there was a total of 27 aeroplanes built.

"During the year at the Buffalo plant of the company there were built 233 aeroplanes having a value of $2,250,000; 914 engines having a value of $3,250,000 and the spare parts produced amounted to over $2,000,000. This spares business has become a very respectable part of our total, as indicated.

"During the week ending Jan. 12, 1929, there was a total of 1,625 men on the Buffalo payroll. This group numbered approximately 2,300 in the middle of December, which was approximately 400 less than the peak for the year which occurred during the month of September.

Total of 562 Robins Were Produced in '29

ST. LOUIS (MO.) — Curtiss-Robertson Airplane Manufacturing Co. produced 562 Robin planes valued at $3,249,000 during 1929. Production was about evenly divided between planes with OX engines and those with Challenger and Wright engines. Altogether, 286 Challenger and Wright-engined Robins, selling at $7,500 each, were built. The OX-engined Robins, retail price of which is $4,000, numbered 276. Of the total number of planes produced, 516 were delivered to distributors or individuals.

In addition to the standard Robin, Curtiss-Robertson will produce a de luxe Robin and a four-place Robin during 1930. The de luxe craft is a refined standard model, while the four-place plane has two sets of side-by-side seats, with dual control and automatic starter included. The four-place machine is wider than the standard model, affording more roominess and visibility to pilot and passengers. It will retail at $8,250.

Pilots Casualty Plans Insurance Expansion

CHICAGO (ILL.)—Bert Wenzel, vice president of the recently-formed Pilots Casualty Insurance Co., this city, announces that plans have been drafted whereby the firm will eventually cover every branch of aviation, insuring passengers, pilots, and planes against crash, or other transport damages, taxi services, ferrying, instruction, etc.

At present the company issues two policies for licensed students, pilots, mechanics, operators, etc., one of which pays a $2,000 accidental life indemnity with an award of $200 a month for a period not to exceed twelve consecutive months if the insured is disabled by accident. The other policy pays a $1,000 accidental life indemnity and pays $200 per month for a period not to exceed two months if the insured is disabled by accident.

Engineering Officers to Meet

DAYTON (OHIO)—Engineering and supply officers from each of the major Army Air Corps stations in the country will come here Jan. 13, to attend the four-day annual aircraft engineering conference of the Materiel Division. Failures of materials and corrections will be discussed.

Business Man Survey Shows 41% Have Flown

WAYNE (MICH.)—Of 3,557 business and professional men in the major cities of Illinois, Indiana, and Michigan who answered a written questionnaire presented by Earl J. Smith, assistant to the President of the Stinson Aircraft Corp., 49 per cent have ridden in an airplane at least once, and those who have ridden at all have ridden on the average four times. Of the 51 per cent who had never taken a ride, many alleged promises to their wives as the reason, others said that their types of business did not require speedy transportation, and a few frankly admitted that they were afraid to fly.

Mr. Smith presented the questionnaire in connection with a series of addresses he made to chambers of commerce, Rotary, Exchange, and Kiwanis clubs. It was noted by officials of these organiations that an increased attendance at meetings occurred when an aviation program was announced. For example, the average attendance at meetings addressed by Mr. Smith was 218 per meeting, whereas the attendance at general meetings had been averaging about 110.

Many Wish to Pilot Planes

In line with this, is the answer of 98 per cent of the men questioned, who expressed the belief that the cause of aviation could be promoted in their cities and suggested as the two chief means, better airport facilities, and more meetings of business men to hear speakers on the latest developments in commercial aviation.

The survey further showed that 87½ per cent of those who answered would pilot their own airplanes if they owned them, while the other 12½ per cent would employ the services of professional pilots. 70.2 per cent of the men expressed a desire to own their own planes. Only 12.7 per cent of the group as a whole read an exclusive aviation publication; the remaining 87.3 per cent rely on the daily press for their aviation news.

Letters Propose Aircraft Union

ST. LOUIS (MO.)—Dale Jackson, endurance flight flier, and L. H. Atkinson, formerly with Universal airlines, are attempting to form a union of pilots, mechanics, and aircraft workers, chartered under the American Federation of Labor. A circular letter has been sent to 140,000 persons in the aviation industry seeking approval of the proposal, and an organization meeting is to be held here in January, Jackson asserted. Several employers are said to be unfavorably disposed toward the project, saying that in many instances collective bargaining with regard to wages would be unfair to individuals.

East Coast Reports '29 Sales

BOSTON (MASS.)—East Coast Airways reports sale of $130,000 worth of Travel Airs during 1929.

PERSONNEL

J. C. GRAVES and WALDRON WILLIAMS, T.A.T. division traffic agents at St. Louis and Kansas City, respectively, will exchange positions. W. H. HOTTEL, recently at Waynoka, becomes passenger agent at Columbus, and R. E. SHIELDS, chief clerk in the Columbus traffic department, is promoted to passenger agent at Waynoka.

LUTHER K. BELL, acting manager since last July, has been appointed general manager of the Aeronautical Chamber of Commerce of America, Inc., by the executive committee.

Luther K. Bell

HARRY C. POLE, recently with Ireland Aircraft Co., has been made chief inspector for American Aeronautical Corp., makers of American Savoia-Marchetti planes, at Port Washington, L. I., N. Y.

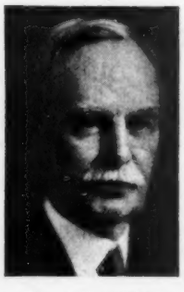
MISS MERLE VANBOSKIRK, recently with the Travel Air Co., at Wichita, Kan., has been transferred to the New York office of Curtiss-Wright Sales Corp.

HAL E. NOURSE, traffic representative of Varney Air Lines at Portland, Ore., has been placed in charge of the company's traffic department headquarters at Seattle, Wash. He replaces C. V. O'CALLAGHAN, who has been transferred to the operations department.

JOHN A. ROSE, formerly export manager of Nash Motors Co., is now associated with the sales force of Parks Air College, East St. Louis, Mo.

JACK DEANE has resigned his position as assistant to the general traffic manager of Transcontinenal Air Transport.

DR. ALBERT F. ZAHM, whose appointment to the Guggenheim Chair of Aeronautics at the Library of Congress was announced last week, began his duties Jan. 2. The position is provided for by an endowment of $140,000 from the Daniel Guggenheim Fund for the Promotion of Aeronautics.



Dr. A. F. Zahm

E. R. STOUT has been appointed factory superintendent for Davis Aircraft Corp., Richmond. Ind.

V. C. WASON has been made assistant to JACK FURLONG, regional traffic agent for Universal Air Lines at Tulsa, Okla.

LOUIS L. SIEBEL, J. A. BOWMAN and LUTHER CREASON, all of Kansas City, Mo., have been made members of the advisory board of Aircraft Finance Corp. of America, according to a recent announcement by President A. O. Hunsaker.

FRANKLIN MOORE has resigned as vice-president and general manager of Fairfax Airport, Kansas City, Mo., to accept a position with United Hotels Co.

IVAN R. OLSON has been made instructor at Standard Flying School, Los Angeles, Calif.

MAJ. HOWARD WEHRLE, general manager of Cessna Aircraft Co., resigned Jan. 1, though he continues to hold stock in the company. STANLEY STANTON, test pilot, has resigned to become private pilot for a contractor in Blackwell, Okla.

C. SHIRLEY REITZEL, recently with Airways, Inc., Akron, Ohio, is now pilot and salesman for Davis Aircraft Corp., Richmond, Ind., covering eastern territory.

COMDR. E. E. WILSON, formerly chief of the engine and design section of the Bureau of Aeronautics, has been appointed vice-president and general manager of Hamilton Standard Propellor Corp., with main offices at Pittsburgh, Pa.

Comdr. E. E. Wilson

THOMAS BROOKS, radio editor of the New York *Evening Journal*, has been made director of radio activities for the Second Annual New York Aviation Show, to be held at Grand Central Palace Feb. 7-15 under the auspices of Aviators' Post No. 743, American Legion.

FRANK T. COFFYN has joined the staff of General Development Co., Hartford, Conn.

MRS. MAY C. ALEXANDER has been made assistant to M. J. RICE, traffic manager for Pan American Airways at Miami, Fla.

RALPH DAMON, recently production manager of Curtiss-Robertson Manufacturing Co., St. Louis, Mo., has been made assistant to J. A. B. Smith, executive vice-president of Curtiss-Wright Corp., New York, N. Y.

J. H. EDWARDS, formerly Comptroller General of Ecuador and the Dominican Republic, has been elected vice-president of Tri-Motor Safety Airways, Inc., affiliated company of New York, Rio & Buenos Aires Line, Inc.

JOHN D. LEWIS has been appointed general manager of Braniff Division of Universal Aviation Corporation, succeeding PAUL BRANIFF, who resigned recently.

RICHARD CRANE has been employed as instructor and pilot for Cheynne (Wyo.) Air Service, Inc.

HENRY P. MAMMEN, president of Parks Air College, East St. Louis, Ill., division of Detroit Aircraft Corp., has resigned to enter another business.

Schools and Colleges

MCMULLEN AVIATION SCHOOL, Tampa, Fla., has equipped all its planes with seat pack parachutes.

UNIVERSITY OF DETROIT is having constructed an aerodynamic laboratory which will be completed about May 1. Part of the new laboratory equipment will be a wind tunnel large enough to test models having a six-foot span.

CURTISS-WRIGHT GROUND AND FLYING SCHOOL, located near Grand Prairie, Tex., held its formal opening program on Jan. 2. Capt. W. F. Long is base manager.

CURTISS-WRIGHT FLYING SCOOL, Los Angeles, Calif. will heareafter include blind flying in its course of instruction.

PARKS AIR COLLEGE, INC., East St. Louis, Ill., is inaugurating a new master engine mechanics' training course of three months' duration. The course will be open only to graduates of the Parks School for Airplane and Engine Mechanics and to licensed mechanics.

U. S. AIRCRAFT ENGINEERING CO., Kansas City, Mo., has established a home study course in aircraft engineering and stress analysis.

STINSON AIRCRAFT CORP. plans to establish a flying school in connection with its Florida headquarters at Daytona Beach sometime this month.

ST. LOUIS UNIVERSAL FLYING SCHOOL, St. Louis, Mo., has moved its sales department to the downtown school at 3312 Lindell Blvd. Floyd Hockridge is sales manager.

RUTLEDGE AIR SERVICE, LTD., Calgary, Alta., has opened a school.

SOUTHERN ALBERTA AIRLINES, LTD., Lethbridge, Alta., reports that it has 23 students enrolled in its aviation school.

AERONAUTICAL CALENDAR

Jan. 14, 1930	S.A.E. Aeronautic Meeting, Miami Fla.
Jan. 21	S.A.E. Annual Meeting, Detroit, Mich.
Feb. 5-12	New York Aviation Show, auspices Aviators' Post, American Legion.
Feb. 15-23	International Aircraft Exposition, St. Louis, Mo.
Feb. 20	Meeting of Committee on Airport Management, Standards and Ethics, Hotel Jefferson, St. Louis, Mo.
Feb. 20-22	Second Annual Aviators Reunion Aviation Post No. 651, American Legion, Chicago, Illinois.
Mar. 6-15	Second Annual Pittsburgh Aircraft Show. Motor Square Garden, Brown Boulevard, Pittsburgh, Pa. Office is Aero Club, Pittsburgh, William Penn Hotel.
Mar. 17	Regional Airport Conference for New England, Providence, R. I.
Mar. 26-Apr. 1	Cincinnati, Ohio, Aircraft Show.
April 5-13	All-American Aircraft Show, Detroit.
May 3-10	New York Aircraft Salon, auspices Metropolitan New York Division, Distributor-Dealers Section, Aeronautical Chamber of Commerce, at Madison Square Garden, New York City.

AIR MEETS

Jan. 13-15	All-American Air Meet, Miama, Fla.
Jan. 15-16	St. Petersburg, Fla.

BRIEFLY

Contract for lighting equipment for this year has been placed with Pyle-National Company of Chicago by Curtiss-Wright Flying Service, both for installation on the company's planes and for sale at Curtiss-Wright Flying Service branches.

Pasadena Aircraft Corp., 211 Clay Street, Pasadena, Calif., has taken over the equipment of Aircraft Manufacturing Corp., and will continue production of the Javelin plane.

Yellow Cab Airways Co. has renewed its lease of the municipal airport, Des Moines, Ia., for another year.

Stewart Aircraft Corp., Cleveland, Ohio, has filed a petition in bankruptcy, with assets of $25,391.50 and liabilities, $44,141.48. The company's hangar at Cleveland Airport will be offered for sale.

Pacific Aircraft Development Co., San Francisco, Calif., has moved its offices from 628 to 105 Montgomery Street.

Onondaga Aeronautical Corp., Syracuse, N. Y., has filed a certificate in the office of the Secretary of State changing its corporate name to General Aviation Co., Inc.

Airway beacons are now in operation on the Waynoka-Wichita and Albuquerque-Clovis sections of the Los Angeles-Kansas City route, and the whole route is expected to be lighted soon.

Kohler Aviation Corp. has rented hangar and office space at Milwaukee County Airport, and will hereafter use this port as the terminal of its cross-lake service.

During the first nine weeks' operation of its Denver-Kansas City and Denver-El Paso passenger lines, Midcontinent Air Express carried 511 passengers. The company has seven Fokker Super-Universal planes in service.

Fahy & McNulty have been given an extension of time until Feb. 1 by the California Railroad Commission in which to start their motor boat service between Oakland Municipal Airport and San Francisco Ferry Building.

Boeing System planes were flown 3,600,000 mi. during 1929, of which about 2,750,000 mi. were flown on the company's transcontinental route. The company has recorded a total of 8,000,000 mi. of flying to date, with only three fatalities. Seventeen hundred tons of mail and 10,000 passengers have been carried.

David Visel, vice-president of Curtiss-Wright Airport Corp., is making a national tour to inspect airport sites, including stops at Pittsburgh, St. Louis, Houston, Los Angeles, San Francisco, Chicago, Milwaukee, Cleveland, and Baltimore.

Robert Purcell has been named receiver for Alliance Aircraft Corp., Alliance, Ohio.

Saul Aircraft Corp., Carroll, Ia., manufacturing the Triad plane, is planning to erect a new factory.

Delay in completion of the North & South railroad in Wyoming has led business men to request the creation of a Cheyenne-Great Falls air mail line.

Aerial Express Corp., Ltd., Los Angeles, of which Alfred Malling is general manager, expects to start business about Jan. 15.

Intercity Airlines, Seattle, Wash., has been sold to Intercity Air Express, Inc., by Washington-Alaska Airways, Inc.

Lockheed Aircraft Corp., Los Angeles, which recently closed its plant for inventory, re-opened a week later because of urgent new business received.

National Motors Co., St. Louis, Mo., of which Ralph Ciura de Castro is president, has purchased American rights to a combination of automatic slot and trailing edge flap developed by Jean Francis DeVillard and Harry H. Sefried.

A total of 13,539 hr. flying time was reported at Parks Airport, East St. Louis, Ill., during 1929.

Lighting of the airway between Seattle, Wash., and Los Angeles, Calif., is expected to be completed about March 1, according to latest reports.

Westinghouse Electric & Manufacturing Co., has made arrangements to use Springfield (Mass.) airport for tests of airplane radio equipment.

A committee of 29 has been appointed by the Jacksonville (Fla.) Chamber of Commerce to promote aviation activities in that city.

An 11,000,000 cp. revolving beacon and 2,760,000 cp. fixed light pointing toward the local airport are to be installed on top of the Bridgeport (Conn.) City Trust Co., building.

Imperial Brass Manufacturing Co., Chicago, Ill., has developed a new type of fuel line connection, known as Hi Duty Service Connection, which will be exhibited for the first time at the St. Louis show.

Jacob Riis Park, Rockaway, N. Y., will continue to have a naval airport during the coming year, but it is understood that naval authorities have acceded to the demands of the Park Board in agreeing to move after that time.

Ray Fortner, piloting a Fokker F-10 for Universal Airlines with twelve passengers and an extra pilot, was reported to have made an average speed of 203 m.p.h., covering the 326 mi. between Cleveland and Chicago in 1 hr. 37 min. on a recent trip. C. T. Robertson, N.A.T. pilot, in a Curtiss Falcon, covered 150 mi. in 45 min., and Charles W. Holman recently made a record of 5 hr. 10 min. for the 1,000 mi. between Minneapolis, Minn., and Washington, D. C., in a special Laird biplane.

Representatives Named

CURTISS-WRIGHT SALES CORP.—Mid-West Aviation Co., Omaha, Neb.; for Iowa and Nebraska.

EVANS GLIDER CO.—F. C. Krummel, 488 Nostrand Ave., Brooklyn, N. Y.

CARDINAL—L. H. Collins, Little Rock, Ark.; for Arkansas.

RYAN—Florida State Airways; for Florida.

STEARMAN — Air Services, Inc., Akron, Ohio.

PRATT & WHITNEY—Air Services, Inc., Akron, Ohio.

SCINTILLA MAGNETO—Bergen County Magneto & Generator Co., 7 Passaic St., Hackensack, N. J.

CURTISS-WRIGHT—Wright & Esenwein, Buffalo Airport, Buffalo, N. Y. The Knoxville Aero Corp., Knoxville, Tenn.; for eastern Tennessee.

TRADE TIPS

It has been reported that

Purchasing agent Wiley L. Thomas of Knoxville, Tenn., has asked for bids on the erection of two hangars, 100x100 ft., and 80x120 ft. at McGhee Tyson Airport.

Tucson, Ariz., glider club, of which Edwin Montgomery is president, is planning to purchase a glider.

Bloomington, Ill., airport plans a hangar to hold eight planes. H. C. Crutcher is airport manager.

Rearwin Airplanes, Inc., Kansas City, Mo., has a new factory at Fairfax Airport and is negotiating new dealer contracts.

Good & Foster Aero Service Co., of Dallas, Tex., will immediately rebuild its hangar, and other buildings which were recently destroyed by fire, with loss of about $250,000.

Southwest Air Service, Inc., of which Haywood Nelms, of Houston, Tex., is president, proposes the erection of the 200-acre airport at Goose Creek, Tex., and erect hangars and make other necessary improvements.

Wichita Municipal Airport, Wichita, Kan., is having plans prepared for an airport administration building which will cost about $225,000, and will soon be ready for bids.

Carpenteria Airport, Santa Barbara, Calif., of which W. C. Smith, Jr., is manager, plans improvement of the property by grading, establishment of a drainage system, the construction of fire-proof concrete hangars and building of a small hotel, at a cost of about $50,000.

St. Louis Board of Public Service will receive bids Feb. 4. for construction of two sewer projects at Lambert-St. Louis Field, this city's municipal airport.

Tyler, Tex., will soon let contract for 100 x 110 ft. hangar with 12 x 100 ft. lean-to. O. C. Palmer is airport manager.

Sheridan, Wyo., has arranged for the purchase of a 200-acre tract of land south of the city which is to be developed into a municipal airport.

Bids will be called for early in January, for the construction of a hangar and runways at Fly Field, Yuma Ariz.

AIRPORTS AND AIRLINES

Uniform Airline Schedules Adopted

New Style Passenger Contract Also Approved

CHICAGO (ILL.)—Through air transport tickets from any point in the United States to any other point touched by the airlines of the country should soon be available to the air traveler. This advance is being made possible through the efforts of American Air Transport Association in synchronizing airline schedules and in making arrangements for the interchange of passengers.

The first definite steps in this direction were taken by the operator-members of the air transport organization with lines running into Chicago and Cleveland at a meeting held last week at the Palmer House. In addition to considering schedules, the group approved the uniform passenger contract and standard ticket forms prepared by officials of the association. The new forms, which bear the passenger contract, will be used to replace the present ticket stocks of the lines as they are exhausted.

Many Approve Action

Those operators approving the standard forms were Boeing Air Transport; Clifford Ball, Inc.; National Air Transport, Inc.; Northwest Airways; Pacific Air Transport; Stout Air Lines and Thompson Aeronautical Corp. The forms were also approved officially by Robert J. Smith, general traffic manager of The Aviation Corporation, for Colonial Air Transport, Colonial Western Airways, Canadian Colonial Airways, Continental Airlines, Embry-Riddle Company, Interstate Airlines, Robertson Aircraft Corp., Texas Air Transport and Universal Air Lines System.

Samples of the ticket forms and the passenger contract will be sent to the remaining six members of American Air Transport Association within the next week or two, as well as to non-member operators. Approval and adoption by these transport lines is expected within 30 days, according to Winsor Williams, manager of the transport body. This will be followed by efforts to synchronize the schedules of all the airlines operating throughout the nation, so that as little delay as possible will be experienced by passengers in changing from one line to another. Once established, the times of plane departures will be rigidly adhered to. In fact, it is reported that disciplinary measures will be taken against any operator, who delays in sending off a plane without sufficient cause.

Before being submitted to the operators, the new passenger contract was approved by a number of leading railroad attorneys. Its adoption is principally for the protection of the air transport operators in case of accident. It is believed that a court of law would be more likely to admit a contract utilized universally by the airlines as evidence in a suit than it would any one of the wide variety of forms used in the past. Admission of the uniform contract as evidence in a suit filed in one state, also, would automatically establish a precedent.

Adopt Three Ticket Forms

Three standard ticket forms were adopted. These are the one-way, round-trip and skeleton forms. The latter is for use when a passenger is to travel over more than one line to reach his destination. Application of the term, "skeleton," arises from the fact that the names of the lines used, other than the one issuing the ticket, are filled in with ink, as is the destination. The ticket forms are made up of a number of sections. The lower one is the agent's receipt. Above that is the auditor's stub, which bears the contract to be signed by the passenger. These two coupons will be detached before the ticket is issued to the passenger, and consequently, are not taken into the plane. Next is the actual ticket for

(*Concluded on page* 81)

P.A.A. Connects Two Routes

NEW YORK (N.Y.)—Pan American Airways, Inc., has announced the opening on Jan. 1 of an air mail line from Guatemala City, Guatemala, to Managua, Nicaragua, forming a connection between the company's Brownsville--Mexico-Central America line, and the Miami-Cristobal-South America route. Intermediate stops on this new link are at Ilopanga Airport, Salvador, and San Lorenzo, Honduras. The through connection thus afforded will effect a saving of two days in the time required for an air mail letter from western United States to reach South America the company states.

T.A.T. Tests Horizon Indicator

COLUMBUS (OHIO)—Tests of the artificial horizon indicator developed by Sperry Gyroscope Co. as an aid to blind flying are being conducted by Transcontinental Air Transport. Officials of the line have indicated that the device would be used on all T.A.T. planes if the results obtained are satisfactory.

Increases Reported By Transport Firms

NEW YORK (N. Y.)—All transport companies which have thus far issued reports covering their activities during 1929 show an increase in business over the record for the previous year. Service and equipment as well as volume of traffic have been consistently improved, bearing out the prediction of Assistant Secretary of Commerce Clarence M. Young that further development is to be expected in 1930. Among the reports received here are the following:

National Air Transport planes were flown a total of 2,646,966 mi. last year, an increase of 400,000 mi. over the record of 1928. Of this amount, 1,270,668 mi. were flown at night. Mail carried was 2,027,959 lb., and express 75,607, representing a total 900,000 lb. greater than that of the previous year. Further progress was indicated by the fact that practically all N.A.T. planes were equipped with radio during the year.

Boeing Flies More Than 3,000,000 Mi.

Boeing System planes covered the greatest mileage, with a total of 3,600,000 mi. flown. Of this, 2,780,000 mi. were flown on Boeing Air Transport lines and the rest by Pacific Air Transport. Boeing Air Transport also showed an increase in air mail loads from 493 tons in 1928 to 906 tons in 1929; and in passengers carried from 1,963 to 2,850. Both lines now use Boeing equipment exclusively, and Pacific Air Transport was able to reduce the flying time between Los Angeles and Seattle by 1 hr. 30 min. by the installation of Hornets for Wasp engines. Radiophones are now being installed on the planes operating over the San Francisco-Chicago route, and it is expected that all planes will be so equipped within 60 days.

Transcontinental Air Transport, whose service was inaugurated in July, carried 4,346 passengers, with 545,354 mi. flown. This represented completion of 86.5 per cent of scheduled flights, or 578 completed out of 669 scheduled.

Colonial Shows Gains

Colonial Air Transport, which inaugurated a New York-Boston passenger service on April 15, and a Buffalo-Toronto passenger service July 29, also showed substantial gains for the year. Together with Colonial Western Airways and Canadian Colonial Airways, these lines carried approximately 10,000 passengers and 400,000 lb. of mail for a total of over 1,000,000 mi. Of the passengers, 5,971 were carried on regularly scheduled runs. The company now has 31 planes in operation, as compared with 19 at the end of 1928.

Engineers Forming Airport Study Group

WASHINGTON (D. C.)—In line with the resolution adopted at the October meeting of the administrative board of the American Engineering Council, A. W. Berresford, the president, is organizing a committee to consult with the Aeronautics Branch on working out a plan whereby the two organizations may co-operate in a study of the engineering problems involved in airport design and construction. This plan of action was recommended by a special committee of the Council, headed by O. H. Koch, Dallas civil engineer and vice-president of the Council.

Consideration previously had been given to the project by the Council's committee on Research Work. Dr. H. E. Howe, chairman of that committee, reported that it had reached the unanimous conclusion that a study relating to the coverage and drainage of airports was one that the Council could very properly undertake. The need for such a study was apparent, he said, because there is no uniformity in present practice and no central source of information regarding the results obtained from the variety of methods and materials now used. The object of the proposed study is to prepare a report on the practices prevailing under various conditions of terrain, climate and the like as a guide for engineers engaging in airport construction. The committee will consist of five members

Canada Mail Flown Million Miles

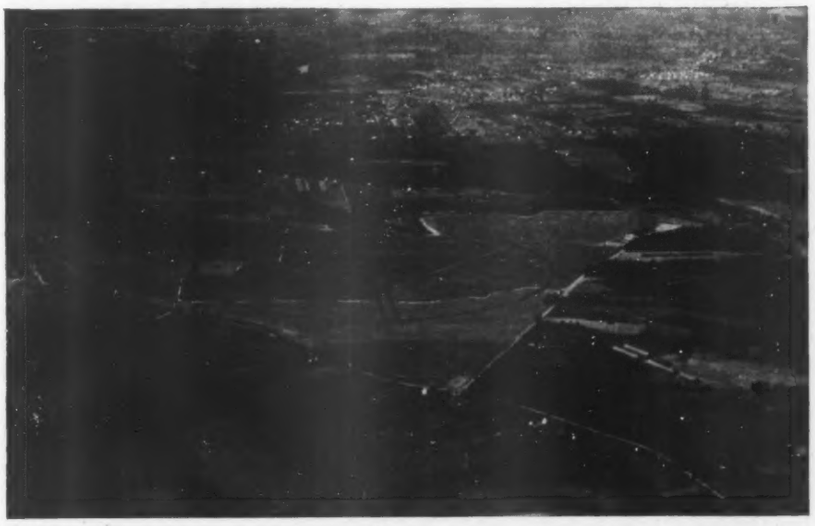
OTTAWA (ONT.) — Canadian air mail planes have traversed over 1,000,000 mi. in 1929. Twelve air mail routes are in operation at the present time and on Feb. 1 the Winnipeg-Regina-Calgary route will be officially opened.

Stout Lines Cut Passenger Rates Again

DETROIT (MICH.)—Effective, Thursday, Jan. 2, Stout Air Services, Inc., operators of Detroit-Chicago and Detroit-Cleveland passenger lines, has reduced its fares to approximately $.075 per mile, or slightly more than rail fare plus pullman charges, it has been announced here by Stanley E. Knauss, vice-president and general manager. The new rates, it was explained, have been made to encourage more widespread use of the air lines during the winter months, and will be in effect during January, February and March.

The air fare between Detroit and Cleveland is $10 and that between Detroit and Chicago, $18. Transportation between the airport and the downtown district in Cleveland, Detroit and Chicago is included in the reduced fares. This is the third reduction made on the Detroit-Cleveland division during the past 12 mo. and the second on the Detroit-Chicago division. Stout Air Services, Inc., approximately six months ago became a member of the United Aircraft & Transport group.

Building Big Airport at Springfield, Mass.



ONE OF THE finest of eastern airports is in the mature stages of construction at Springfield, Mass., under the auspices of former Congressman Henry L. Bowles, of that city, and his associates. The tract comprises about 275 acres of level, sandy land about 5 mi. west of Springfield in the town of Agawam. It is roughly triangular in shape, the sides measuring about 4,000 ft. Asphalt take-off strips 1,000 ft. long have been installed in four directions. These are connected by asphalt taxi-strips. It is classified as an all-way field, the entire surface being grass covered except for the asphalt installations. In the upper right hand-corner may be seen the first hangar, a brick, steel, and cement structure capable of housing about twenty planes. Construction of the airport was started in 1928 and it will be opened for commercial flying this spring.

N. Y. & Rio Will Open New Section of Its Line

NEW YORK (N. Y.)—Following its previously announced plan to open its airline northward from the Buenos Aires terminal section by section, the New York, Rio & Buenos Aires Line, Inc., will inaugurate the entire Buenos Aires-Rio de Janeiro section Jan. 15. This will place in operation about 1,500 mi. of the 9,000-mi. route linking this city with the South American terminal. It will be operated once a week for passengers, mail and express with Consolidated Commodore flying boats.

Cities connected by this service include Buenos Aires and Montevideo, and the Brazilian cities of Pelotas, Porto Alegre, Florianapolis, Paranagua, Santos, São Paulo and Rio de Janeiro. The cities of Buenos Aires and Montevideo have been connected by a daily service since Aug. 21, 1929, and this will be continued. The company also is operating a weekly service between Buenos Aires and Santiago, Chile (opened Sept. 1, 1929), so that with the opening of the new extension, the company will be flying over a 3,500-mi. route.

Equipment consisting of Commodores and Sikorsky S-38 amphibions already is stationed at many points along the proposed line and sections will be opened as rapidly as ground organization permits. Officials expect that the previously announced schedule to have the entire New York-Buenos Aires line in operation some time during February will be realized.

Four Entry Ports Named

WASHINGTON (D. C.)—Four new airports of entry were designated by the Bureau of Customs of the Treasury Department on Jan. 4. They are Portal and Penbina, N. D.; Port Angeles, Wash.; and Douglas, Ariz. In the opinion of the Treasury officials in charge of the work, there is enough regular international air service to these points to justify the provision of customs facilities.

Other cities that have been designated as airports of entry are: Newport, Vt.; Albany, N. Y.; Buffalo, N. Y.; Detroit and Gross Isle, Mich.; St. Paul, Minn.; Seattle, Wash.; Los Angeles, Calif. (where there are now two fields); San Diego, Calif.; Nogales, Ariz.; El Paso, Tex.; Newark, N. J.; Miami, Fla., and Palm Beach, Fla.

Dec. Mail May Show Drop

WASHINGTON (D. C.)—Air mail poundage for December probably will total considerably less than that for November, according to Post Office officials. The ten days of fog, followed by snow, which prevailed over a great part of the transcontinental route is considered responsible for this condition. Even with the figures from the Christmas mail peak included, the total will probably fall far short of expectations.

AIRPORT CONSTRUCTION PROJECTS

East

THE MEMORIAL Administration Building at the Boston Municipal Airport was dedicated Dec. 30. This is a two-story building facing the airport. On the first floor there are the following rooms: General waiting room (42 x 25 ft.), lunch room accommodating 50 persons, telegraph room and press room, news-stand, ticket office, air mail work room, emergency first aid room, offices for federal officials, a lavatory, lounge, telephones, etc. Adjoining is a one-story garage housing an ambulance, chemical fire engine, motorcycles, trucks and a boiler room.

On the second floor are the following rooms: Airport manager's office, meteorological room, communications room, offices for federal and state inspectors, private suites for visiting women pilots, bedrooms and baths for visiting men pilots and a room for physical examination of pilots. Above the manager's office is a control tower and balcony commanding a full view of the entire field.

Roosevelt Flying Service, Roosevelt Field, N. Y., is about to begin construction of an all-steel, hangar to house fifteen planes, an administration building, shops, etc., at an airport in West Palm Beach, Fla. The improvements will cost about $100,000.

South

Permission has been granted Washington Airport, Inc., at Clarendon, Va., to erect a new administration building and two hangars on its property near the Arlington Memorial Bridge across the Potomac River. The administration building will be of brick and concrete, two stories high. The first floor will include ticket office, waiting room, rest rooms, etc. The second floor will consist of an observation deck commanding a view of the field and the Potomac River. Above this will be a control tower and observatory.

The new 100-ft. concrete apron in front of and connecting hangar buildings at Meacham Field, Ft. Worth, has been completed. Walks connecting the hangars also have been laid. Expenditures for the two projects totaled $18,000. Funds for the concrete work were realized from the sale of $150,000 of the $500,000 item for airport improvements voted at a municipal bond election several months ago. An administration building and half of another hangar group will be financed with the remaining money from the initial bond sale.

L. K. Crawford, mayor of Bonham, Tex., has let the contract for erection of 60x80 ft. hangar at the municipal airport.

Steel for the new Western Air Express hangar at Albuquerque has been received and is being assembled at the field.

The new Roswell (N. M.) Airport, costing $50,000 was dedicated Dec. 4-5.

Emergency field at New Albin, Ia., is being equipped with border lights and a beacon on 51-ft. tower, entire system to be controlled by an astronomic time-clock. The work is being done by a crew of eight from the Aeronautics Branch.

A fund of $3000.00 has been raised for conditioning the new Winter Haven (Fla.) Municipal Airport. It will be used for preliminary work on the 120-acre site, which has been rented for four years at $1,500 yearly. Included in the improvements when financing is completed, are two large buildings adapted to a headquarters and a flying school. The local field will be dedicated Jan. 21.

The new concrete hangar and the lighting system at Kinsolving airport, Abilene, Tex., have just been completed. The terminal building will soon be ready for occupancy. A building permit has been issued to the Magnolia Petroleum Co., to erect a $9,000 filling station at the airport.

The City Council of Danville, Va., has increased its airport appropriations $20,000 for the constructon of hangars and shops. The airport is leased to the Lynchburg Flying Service, Lynchburg, Va.

Establishment of an airport at Dania, Fla., was announced recently by J. B. Fornin, chairman of the aviation committee.

Del Rio, Tex., has purchase 126 acres at $6,800 for the development of a municipal airport.

Fourteen locations are being considered for the establishment of the Tampa (Fla.) Municipal Airport.

The new marine base om Curtiss-Wright Flying Service at Miami was dedicated Jan. 4.

Central

The Burlington (Ia.) city council has completed arrangements with the Burlington Airport Co., lesses of the 50-acre airport near the city, by which the municipality takes over the remaining two years of the lease period and it was announced plans are being made to add another 50 acres to the tract. A. J. Hartman, who has been manager for the airport company, will be retained as manager of the port under the municipal control.

Of the $250,000 voted at Omaha, Neb., for a municipal airport over a five-year period, approximately $80,000 has been spent, leaving $20,000 available for 1930. A report compiled by Amos Thomas, chairman of the air transportation committee of the Omaha Chamber of Commerce, declares that most other cities of Omaha's size have spent considerably more to date than has Omaha.

A 180-acre airport with a hangar will be established at Battle Lake, Minn., through a gift of P. D. Ball, St. Louis capitalist and sportsman. Mr. Ball, who holds an interest in the Ryan Aircraft Corp., purchased a 180-acre farm ½ mi. north of the village on Battle Lake, and has arranged for improvements.

Pine Bluffs, Ia., about 40 mi. east of Cheyenne on the transcontinental air mail route, is rapidly improving the emergency field there. Recently a new ceiling light was installed. Additional light cables also have been moved to the field and will be put in place this spring.

The City Council of Newark, Ohio, has approved a bond issue of $20,000 with which to purchase a site for an airport. The port is to be used for a proposed air mail line from Columbus to Philadelphia, it is said.

West

Northwest Air Service, Inc., is making extensive improvements at its Renton Airport at Bryn Mawr near Seattle, Wash. The usable size of the field's runway is being enlarged by dragging and rolling. Space is being provided for automobile parking and the approach to the airport from the Renton Highway is being widened, straightened, and graded.

Construction of a hexagon-shaped hangar, similar to the one built at the Los Angeles terminal of the Western Air Express, is to begin immediately at the new San Francisco Bay Airdrome at Alameda, according to Western Air Express officials. The new port is expected to be completed early in the spring.

T. A. T.-Maddux Air Lines is reported to have bought the Monterey, (Calif.) peninsula airport for development.

The Navy Department has appropriated $10,000 for improvements at the Long Beach (Calif.) Naval Reserve Air Station.

Pilots of Santa Paula, Calif., are purchasing property and will develop an airport with hangar for six planes.

W.A.E. Extends Line South

LOS ANGELES (CALIF.)—Extension of the San Francisco-Los Angeles line of Western Air Express to Agua Caliente, Lower California, on a daily schedule, has been announced by C. W. H. Smith, general traffic manager, the new schedule having been placed in effect on Dec. 24. The southbound San Francisco plane will arrive at the Los Angeles terminal at 12:10 p.m. daily and depart 10 min. later for Agua Caliente via Long Beach and San Diego. The return trip will be started in time to connect with the evening plane north from Los Angeles to San Francisco. The company has formerly operated between Los Angeles and Agua Caliente on week ends and holiday occasions only. Opening of the winter racing season at the famous resort town guarantees heavy traffic over the newly inaugurated daily schedule.

Pyle-National Uses New Lamp

CHICAGO (ILL.)—Increase of 50 per cent in projection range has been obtained with Type 2375 floodlight manufactured by Pyle-National Company by the use of a 1500 watt, 32 volt, T-24 prong base lamp in place of the 110 volt, C-5 Filament lamp. Beam candle power of this light with 23-in. projector is increased 65 per cent.

Administration Unit At Glendale Completed

GLENDALE (CALIF.)—Completion of the new $150,000 depot and administration building at the Grand Central Air Terminal has been announced by officials of the field, now a unit in the chain of Curtiss-Wright Airports Corp. The five-story control tower fronts on the 276-acre landing field, commanding an unobstructed view of all airport ground and of the air lanes in the vicinity of the field. Within the tower itself are the offices of general manager, Bogart Rogers, the publicity department, press room, and the control room at the top

The Tower on The New Building

from which all airport lights are controlled and plane traffic is directed.

Also housed in the depot building are the business offices of the airport, a large waiting room, baggage rooms, ticket office, rest rooms, display rooms, and a large and modern restaurant on the second floor and overlooking the airport. This restaurant is being operated under the management of the Interstate Corp., which also operates restaurants at the Oakland Airport, and the Los Angeles Airport.

P.O. to Open Montevideo Extension

WASHINGTON (D. C.) — Effective Jan. 20, the Miami-Cristobal-Buenos Aires mail service operated weekly by Pan-American Airways is to be extended officially to include Montevideo, Uruguay, the Post Office Department has announced. The first plane southbound from Miami under this new arrangement was to take off today, Jan. 11, arriving at the Montevideo on the 20th or 21st. The combined postage and air mail fee will be at the rate of $.55 for each half ounce or fraction thereof.

New Routes to Canada Discussed

WASHINGTON (D. C.) — Assistant Postmaster General Glover was in Ottawa this week to discuss with Canadian officials the establishment of additional air mail services between certain border cities of the two countries. Connections between St. Paul-Minneapolis and Winnipeg and Great Falls, Mont., and Winnipeg were mentioned as possible routes. Present routes operated under federal United States and Canadian auspices are between Montreal and New York and Seattle and Victoria.

Los Angeles Siding To Be Called "Lairport"

LOS ANGELES (CALIF.)—"Lairport," cleverly conceived as a combination and contraction of "Los Angeles Airport," will appear on Southern California maps after Jan. 15, as representing a siding and junction point on the Santa Fe rail lines serving the Southern California area. "Lairport" replaces "Wiseburn" on the railway map, the latter name having been used since 1888 to designate what has been one of the most active shipping points in Southern California for the handling of hay, grain, cattle, and vegetables.

"Lairport" not only instantly identifies itself with the new airport and the industrial trend in that locality which includes in addition to the flying activities on the field, the Moreland Aircraft factory and Pickwick Nitecoach factory, but some of the confusion which has existed since the airport was established about 18 months ago will be eliminated since all other names, including "Mines Field," which the airport has been called, will go into the discard.

The Los Angeles Airport consists of 640 acres of level land situated approximately 11 mi. from the city center.

Uniform Air Tickets

(Continued from page 78)

transportation to a specified destination, and, finally, the passenger's receipt.

Specially water-marked paper bearing the name of the transport operators' association has been adopted for the tickets. Under the arrangements that have been made, certain printers in various parts of the country will be licensed to buy this paper from the mill for the purpose of printing tickets for the airlines. They will be forced to account for every sheet used, even wastage. This is to prevent fraud. One-way tickets will be printed on green paper, round-trip on gray, and the skeleton tickets on light red. Adoption of the standard colors and forms, it is believed, will do much to impress the air traveler with the stability and permanence of air transport. The passenger probably will be more willing to sign the contract on the auditor's stub, too, since the tickets will all have the same general appearance.

Port Managers Aid Signal Control Study

WASHINGTON (D.C.)—Airport operators are responding vigorously to the request for information concerning air traffic made by A. Pendleton Taliaferro, Jr., Secretary of the Committee on Standard Signal Systems for Airports. In view of the increasing necessity of a uniform system for the control of air traffic on and near airports, this committee was organized by the Aeronautics Branch to study and report the situation. Representatives of the Aeronautical Chamber of Commerce, the Bureau of Aeronautics of the Navy, the Air Corps, the National Advisory Committee for Aeronautics, the Bureau of Standards, and the Aeronautics Branch of the Department of Commerce, are included.

In an endeavor to obtain information concerning signal systems in use at air fields a letter was sent out to airport owners, operators, and managers. Replies have been received from practically all major ports, and numerous smaller fields. A digest will be made shortly for the committee's study of all information and suggestions submitted.

Part of the problem facing the committee is the development of a uniform system of control which will be suitable for night and day use. In the opinion of the committee three means—oral, visual, and radio—will ultimately be adopted by major terminals for traffic control. A standard method must also be developed for communicating special information to pilots in the vicinity of airports.

Fords Fly 18,000 Mi. Daily

DETROIT (MICH.)—A total of 68 Ford tri-engined all-metal monoplanes now being used by nine regular schedule air lines in the Americas are piling up a daily mileage of more than 18,000 mi., according to figures issued here by the Stout Metal Plane Company, division of Ford Motor Company. The figure arrived at, 18,481 mi., does not include mileage accumulated by Ford planes on sight-seeing tours, or those used by private operators for pleasure or in connection with their business. Companies included in the Ford company's tabulation are: Colonial Air Transport; Cia. Mexicana de Aviacion; Transcontinental Air Transport-Maddux; New York, Rio, & Buenos Aires; Northwest Airways; Pan-American Airways; Southwest Air Fast Express; Stout Air Services; Mamer Air Transport; and the Ford freight lines.

Maddux in Air-Rail Plan

LOS ANGELES (CALIF.) — Maddux Air Lines and the Southern Pacific Company on Dec. 28 put into operation an air-rail service for the Pacific Coast. This new service will reduce the cost of air travel on the Coast approximately one-third, according to figures released by F. S. McGinnis, vice-president of the Southern Pacific.

FOREIGN ACTIVITIES

Mexican Air Week Attracts U. S. Interest

MEXICO CITY (MEXICO)—Aviation in Mexico won further national interest through Aviation Week celebration Dec. 10-16. It was so successful that the sponsor, the Mexican Association of Aeronautics, has announced a similar celebration will be held this year, probably about Christmas time. The Association estimates nearly a quarter of a million persons witnessed the celebration and approximately 35,000 paid admission to the special field between the Central Civic Airport and the military section of Valbuena Flying Field, which was the scene of activities.

Net receipts amount to about approximately $20,000. This will be distributed among the various schools of civil aviation in Mexico. The larger share will be given the Emilio Carranza School of Civil Aviation, Mexico City.

Seven countries sent special representatives. The United States was represented by Maj. Clarence L. Tinker, of Kelly Field, Tex., who flew here with four planes; Great Britain by Flight Comdr. Lionel O. Charlton of the Royal Air Force; Italy by Commandante Leonardo Escaroni of the Royal Italian Air Service; Brazil by First Foreign Secretary A. Moreira de Abreu; Guatemala by Artúro Aguirre Matheu, chief of the department of civil aviation; Honduras by Federico Aldubin, Minister to Mexico, and Costa Rica by L. de Villafranco, charge d'affaires to Mexico. In addition to these government representatives delegations from the Los Angeles and San Francisco Chambers of Commerce came here by plane.

The following fifteen American companies each sent one plane to the show: Travel Air, Fairchild, Gates, Acme, Superior, Alliance, Butler, Curtiss, Spartan, American Eagle, Golden Eagle, Timm, Kreutzer, Cessna and Lockheed.

C.A.T. Sells Coupon Books

TORREON (MEXICO) — Coupon mileage books have recently been placed on sale by Corporacion Aeronautica de Transportes, S. A., which operates several mail and passenger routes out of Mexico City, as well as across the continent from Matamoros to Mazatlan. Coupons with a transportation value of 1,000 pesos ($1,000) are sold for 650 pesos. Flying time between Matamoros and Mazatlan has recently been reduced 3½ hr. by the use of Lockheed Vega planes. Lockheed planes have been used since August to maintain a schedule of 11 hr. 15 min. between El Paso and Mexico City.

Moths Ride Gale Across the Channel

LONDON (ENGLAND) — On Saturday, Dec. 7, two De Havilland Moths were flown safely across the English Channel despite storms which halted all cross-channel shipping as well as regular air services. Wind velocities up to 75 m.p.h. were reported. The two pilots who had urgent business in France were Alan Butler, chairman of the De Havilland company, and Nigel Norman, director of Heston Air Park. They were accompanied by their wives.

China-Berlin Line Looms

NANKING (CHINA)—An agreement is expected shortly between the China National Aviation Corp. and the German Luft Hansa providing for air communication between Berlin and Shanghai. The route will probably be across Siberia to Irkutsk, thence south over Mongolia to China proper. The tentative agreement reported to have been reached is one of the first contracts between Chinese and foreign negotiators which stipulates that in case of differences in interpretation the Chinese version shall be considered as authoritative.

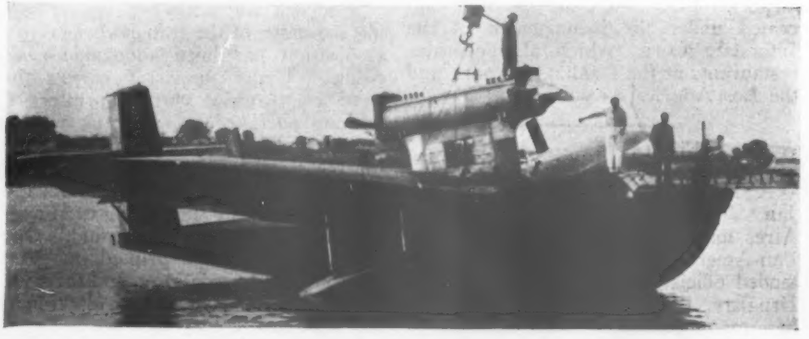
Fokker Amsterdam Works Has Anniversary

THE HAGUE (HOLLAND) — Nederlandsche Vliegtuigenfabriek at Amsterdam was founded by Anthony Fokker July 21, 1919, and is now celebrating its tenth anniversary. Fokkers are now used in 30 countries by 35 aviation companies and are built by eighteen factories in fourteen countries.

Anthony Fokker more than 20 years ago, when at college at Haarlem and living with his parents, constructed various models of gliders and in 1910 attended a course at a German aviation school, the proud possessor of one plane which came to an untimely end. Fokker started construction of another plane, which is the prototype of the present Fokkers, assisted by two workmen. He took his license on it on May 24, 1911.

Next year he participated in the flying demonstration at St. Petersburg, Russia, and built a few other planes. He tried to induce the Dutch government by a flight from Hague to Berlin to adopt his model for military purposes so that he might start a factory. Not meeting with success, Fokker tried in vain to interest the English government in his plans. Following a demonstration in Germany, Fokker was awarded a first prize as well as a trial order of ten planes and the German government, moreover, put him in charge of an aviation school with a factory employing 30 men. During the world war this was developed by Fokker as an aviator and a constructor to a big industrial enterprise. When the war ended, Fokker returned to Holland and started his Amsterdam works.

Liore et Olivier Builds New Flying Boat



THE LIORE ET OLIVIER company has produced a new high monoplane wing flying boat with twin engines arranged in tandem. The machine is designated as the LeO.H.240. The engines are Renaults of 500 hp. mounted above the single wing. Its specifications are as follows: Span 85.94 ft.; length 61.01 ft.; height 20.66 ft.; wing area 1,129.8 sq.ft.; weight empty 9,479.8 lb.; normal useful load 4,122.6 lb.; weight of full fuel load 2,336.9 lb.; total weight 15,939 lb.; maximum speed 121-124 m.p.h.; landing speed 56 m.p.h.; ceiling 13,120 ft.

Plane-Ground Radio Photos Called Success

BERLIN (GERMANY)—The German air line Luft Hansa has recently been carrying out tests to determine the suitability of photo-telegraphy (radio) in the service of aviation. The apparatus employed was that of the German Fultograph Co., such as is used for ordinary picture transmission throughout Germany. The results of the tests have been so satisfactory that there is every likelihood that photo-telegraphy will be introduced by the company in the near future with the object of increasing safety in air travel.

The first application probably will be the transmission of weather charts and sketches of airports from the ground station to the airplane. [This was accomplished in the tests referred to.—Ed.] To counteract possible interruption of the service owing to the fluctuating movements of the plane, a sponge saturated with the potassium iodide starch solution necessary for the receiving apparatus was used during the tests instead of the usual container with solution. Steps are being taken to construct special apparatus for aviation purposes. Tests are also in progress in connection with the transmission of pictures from the airplane to ground stations. In addition, the Luft Hansa is carrying out tests with a view to determining the suitability of ultra-short waves (ranging round 5 m.) for aviation purposes. Results obtained up to now on the Berlin-Konigsberg route have been quite satisfactory.

Burney Announces R.100 Costs

LONDON (ENGLAND) — Definite figures on the cost of the R.100 were given recently in a speech by Comdr. Sir Denistoun Burney of the Airship Guarantee Co. The capital expenditure on the plant where the airship was built, was £105,000 ($510,300), of which the government contributed £50,000 ($243,000). The dirigible itself cost £440,000 ($2,138,400), and was sold to the government for £300,000 ($1,458,000). The cost to Vickers, Ltd., backers of Airship Guarantee Co., was thus £195,000 ($947,700). Sir Denistoun expressed the opinion that development of the airship as a profitable commercial vehicle would require a five-year program costing at least £3,000,000 ($14,580,000).

French Firms Have New Models

PARIS (FRANCE)—Avions Morane-Saulnier has just finished a training type parasol monoplane with rigid bracing, large-tread divided undercarriage and 120 hp. Salmson engine. Avions P. Bourgois is completing a two-place low-wing monoplane with Michel engine of 80 hp. Avions Albert is building a low-wing two-place light plane. It recently tested a light postal twin-engined cabin monoplane, with two 60 hp. Walter engines.

Albatross Firm Builds Sport Plane

THE KOBALD, A LIGHT touring or sport plane, has been produced by the Albatross works in Germany. The machine is a biplane with both wings of equal span and chord and with no stagger. It has a split axle under-carriage. The following specifications have been received: Span 28.86 ft.; height 7.34 ft.; length 20.56 ft.; weight empty 1,023 lb.; total weight with normal load 1,408 lb.; high speed 102 m.p.h.; landing speed 45-47 m.p.h.; endurance with normal load 2½ hr. It has a wing area of 178.68 sq.ft.

India Plans Aviation Budget

DELHI (INDIA)—The Indian budget for 1929-30 calls for an expenditure of £178,050 ($765,080) on aviation, and present plans call for the expenditure of £1,125,000 ($5,467,500) for the development of aviation, including meteorological and radio facilities, during the next four years. Up to March, 1929, when the last complete report was made, the Indian Government had spent £240,000 ($1,166,400) to aid civil aeronautics, including £30,000 ($145,800) as a contribution to the building of the R.100 and R.101. Airlines in India are also subsidized.

German Firms Plan Expansion During 1930

BERLIN (GERMANY) — Statements from the heads of various important German aviation companies reported by the New York *Times* correspondent indicate the probability of general expansion during the current year. Of particular interest are the various projects for establishing airlines to South America. Dr. Eckener disclosed the fact that the Graf Zeppelin will cross the equator for the first time, to obtain data on the performance of airships in tropical regions. Director Martin Wronsky of Luft Hansa also reported the hope of establishing a regular airplane service to South America in the near future.

Dr. Claude Dornier and Dr. Rohrbach both expressed the belief that co-operation between their firms and American interests would lead to greater progress during the year. Dr. Dornier said that development of large planes was being held back by troubles with large engines. The Do.X will be used in an attempt to better various records as soon as minor engine difficulties are corrected.

Aero Introduces New Eight-Passenger Plane

PRAGUE (CZECHOSLOVAKIA) — Test flights of the new Aero A-38 cabin transport plane having been entirely successful, the model is now in production on orders from the government airlines, and Compagnie Internationale de Navigation Aerienne. It is an eight-passenger biplane, powered with one Walter-Jupiter 420 hp. nine-cylinder, air-cooled radial engine, and is in all essential respects a development of the company's earlier models, A-23 and B-25.

Fuselage construction is of riveted steel tubing, so arranged that there are no cross members in the passenger cabin. Wing structure is of wood, with metal bracing. Both fuselage and wings are fabric-covered. The wings are not appreciably staggered, but the upper wing is of considerably greater chord than the lower. Cabin for two pilots is forward and separate from the passenger compartment, and is almost completely glass-enclosed. Dual control is provided. Visibility is further improved by the fact that the upper wing is set well above the fuselage. Only the upper wing is equipped with ailerons. Specifications are as follows:

Span, 54.5 ft.; length, 42 ft.; height, 15.08 ft.; wing area, 721 sq.ft.; wing loading, 9.82 lb. per sq.ft.; horsepower loading, 16.7 lb.; weight empty, 4,115 lb.; gasoline, 736 lb.; oil, 88 lb.; pay load, 1,980 lb.; gross weight, 7,040 lb.; maximum speed, 118 m.p.h.

Chiapas State Has Nine Ports

MEXICO CITY (MEXICO)—The state of Chiapas, southernmost state of Mexico, is coming to the fore in the matter of aviation. Nine airports have been established there and another is being rapidly completed. Work on these airports has been done by federal soldiers.

Short Bros. Build Metal Convertible Monoplane

ROCHESTER (ENGLAND) — Advance information in regard to the large convertible monoplane now under construction at the factory of Short Bros., makes it clear that the machine will be a radical departure from the planes previously built by this company. Since it is of about the same size, and will carry the same power as the Short Calcutta flying boat (three Bristol Jupiter 525 hp. engines), it will give an accurate gage of the comparative advantages of the biplane with boat hull and the monoplane on large twin floats. The fact that it is easily convertible to a landplane may lead to its use on the route from Cairo to the Cape, which would otherwise require double equipment of land and seaplanes.

The new plane has a monococque all-metal fuselage, and metal structure throughout. The wings have metal walkways on the upper side, but are otherwise fabric covered. The wingspan is 107 ft., and the distance between the floats, 20 ft. The weight fully loaded will be 20,685 lb., of which 7,984 lb. is useful load. Carrying seventeen passengers, pilot and navigator, the range is calculated at 500 mi., with top speed of 136 m.p.h. Landing speed is estimated at 67 m.p.h. The three engines are given the conventional placing in the nose and under the wing on each side of the fuselage.

Austria Fixes Airport Charges

VIENNA (AUSTRIA) — Standard charges for all Austrian Airports except the one at Innsbruck have been worked out, and are awaiting approval by the Ministry for Commerce and Trade. Landing fee will be 3 schillings ($.43), and housing a plane 24 hr. will cost 3 schillings if the wing span is 12 meters (39 ft.), 4.4 schillings ($.64) if the wing span is 12 to 20 meters (39-65 ft.) and 7.5 schillings if the wing span is over 20 meters. All Austrian airports now have restaurant, first aid station, telephone, and at least small quantities of gasoline and oil available, according to report made by the U. S. Department of Commerce representative.

May Increase K.L.M. Subsidy

THE HAGUE (NETHERLANDS) — A bill to increase government subsidy to K.L.M. by 1,000,000 florins ($400,000) was introduced into the second chamber last fall, according to a report made by the U. S. Department of Commerce representative here. The company has also been authorized to issue bonds to the extent of 2,500,000 florins ($1,000,000) with principal and interest guaranteed by the state. The government is also committed to the purchase of 25 shares of K.L.M. stock at 100,000 florins ($40,000) each, 10 of which were to have been paid for by this time.

Norwegian Pilots Explore Land

OSLO (NORWAY)—Word has been received here from the Norwegian Antarctic Expedition that the well-known Norwegian pilots, Captain Riiser Larsen and Captain Lutzow-Holm have discovered and made claim to new land between Coates Land and Enderby Land in the King Haakon VII Sea, opposite the tip of South Africa. They used a plane for the discovery trip.

Foreign News Briefs

M. Santos-Dumont received the Grand Cross of the Legion of Honor in Paris recently.

New seven-passenger, tri-engined Fokker planes will be used for service twice weekly between Vera Cruz and Merida, Mexico, on the Mexican Aviation Company line, while the weekly service with a Ford plane is continued.

Benjamin F. Johnson, of Rye, N. Y., is constructing a $100,000 airport at Los Mochis, Sinaloa, on the west coast of Mexico. The field comprises 250 acres, with runways 100 ft. wide, 3,500 and 6,000 ft. long. A 3,000,000 cp. revolving beacon has been installed and a steel hangar for eight planes is being built.

Three runways 132x4,000 ft. have been completed at the new Civil Airport, Mexico City, drainage system installation is finished, and work on a station-hotel is progressing rapidly. The first 10x120 ft. steel hangar is also nearly ready.

Aurora Field, military airport of Guatemala, is being used as a terminal by Mexican Aviation Co. and Pickwick Air Lines.

Possible airport sites in the Canary Islands were inspected by the pilots who recently made a round trip from Seville to Santa Cruz in an Arado plane, as part of the survey of the proposed Luft Hansa Germany-South America route.

A Fokker VIIB with three 300 hp. Wright engines has been completed in Amsterdam for Van Lear Black, who expects to start on a cruise next month with Tokio as his destination.

Australian National Airways, Ltd., has inaugurated passenger service between Sydney and Melbourne, Australia.

A request made by the American Legation to permit a U. S. Army Air Corps attaché to operate a private plane has been refused by the Chinese Government.

According to a recent report, a center section 75 ft. long, to contain a gas bag with a capacity of 500,000 cu.ft., will be added to the British dirigible R.101. This should add six tons to the useful load.

During November, there were 292 arrivals and departures at Le Bourget Airport, of planes carrying 1,680 passengers and 308,200 lb. of freight.

Tests of the experimental plane constructed from the design of Vittorio Isaaco, similar to the Cierva autogiro type except that it has engines near the tips of the rotating blades, are being conducted by the British Air Ministry.

Nearly 60 tons of air mail were carried in Sweden in 1929, as compared with about 40 tons during the preceding five-year period.

At a recent six-power conference in Berlin, arrangements for international air-mail service across Europe were made, with tickets available in Germany, England, France, Italy, Belgium and Portugal.

K. L. M. Service to Batavia has been suspended because the Government of India has decided that Indian airports on the route are not suitable for use, although officials of the Dutch line have reported their willingness to continue with present facilities.

Interior of New Latecoere Cabin Passenger Plane

LOOKING FORWARD in the cabin of the new Latecoere 28 single-engined monoplane (Described in AVIATION for Dec. 7). The craft accommodates eight in addition to the crew. Note the dials at the front of the cabin. These are a speed indicator, altimeter and a clock. Modernistic tendencies feature the interior decoration. Provision is made for 1,000 lb. baggage.

WHAT OUR *Readers Say*

A Business-Flying School

TO THE EDITOR:

The writer was much interested in your editorial entitled "Salesmen Not Pilots." Your comment on the need for Aviation Business Schools, leads me to tell you of the courses now given in the General Aviation Schools in Elmira and Ithaca, New York.

After considerable study of existing Ground Schools, the officials of this company felt that the students should receive some business training. The major portion of instruction given in our Ground School, is given by instructors from the faculty of Cornell University, and covers the subjects required by the Government.

The course prepares our students for the Ground School examinations for Private and Limited Commercial Pilots and devotes an additional ten hours to instruction in business subjects. We teach airport management, covering the selection of airport sites, construction of airports, types and cost of hangars, sources of revenue, leases, airport regulations and airport lighting. Airplane Salesmanship covers a study of markets, types of aircraft and costs, study of operating costs, commercial uses of planes, advertising, selling methods, deferred payment plans. Business administration covers some accounting, study of insurance, avaition law and management practices.

The instructors in these latter subjects have been carefully selected and we feel that we have started in the right direction in the selection of the men who give such instruction.

It is true that some of our students feel that the business courses are unimportant to future pilots and mechanics, but in the main they see the wisdom of this type of instruction. We feel that no student should leave us without an intelligent grasp of the business side of aviation. It is our firm belief that many of our students will never be pilots or mechanics, for they will probably find their places more readily in other types of work. It is our hope that we will eventually be turning out young men and women who will be fitted to take their place as salesman and junior executives in the industry.

We know that this cannot be accomplished in a short period of time, but we know that the foundation can be laid for such a development over a period of time. In the near future we will probably be forced to have a strictly Business Course.

It is the writer's belief that 1930 will see many changes in the industry and that managements of factories, operating companies, and schools will more than ever appreciate the necessity of business like operation, heretofore not too prevalent, when one considers the industry as a whole. A certain Wall Street broker, said jokingly that the definition of an aviation company was "Capitalized for one hundred million, worth a million and loses a million a year," and this is not without some truth.

Certainly at the present moment the hard-headed business man does not regard the aviation business in any of its branches with the same enthusiasm that he did ten months ago. Until he sees the business more firmly established along lines which he understands, he will remain "air minded" but not "air confident."

Education is all important to the industry and this means intelligent education of the public and education of our students. The responsibility imposed upon the operators of schools cannot be regarded lightly nor can instruction be given casually. Those operators of schools who do not exert every effort to build up a curriculum for their respective schools along sound and intelligent lines will soon see many vacancies.

The courses to be given must be carefully planned. It is easy to say that "our course complies with the Government requirements." That sounds very well, but it is far from enough. The course should go beyond this and train the student to do work all important to aviation, but not in the Government regulations. Certainly no more than fifteen per cent of the work connected with aviation is actual air work. The rest is done on the ground, on airports, in schools and in factories.

There never was a better opportunity for school operators to exercise their ingenuity and gradually build their reputation for the years to come. It would seem that those who are sufficiently far sighted will be well rewarded by the profits which will accrue to them for work well and intelligently done.

SHERMAN P. VOOHEES,
Manager, General Aviation Corp., Elmira, New York.

[Mr. Voorhees' suggestion of including the teaching of aeronautics as a business with the teaching of flying is one with which we strongly sympathize in principle. The experiment is now being tried by a number of schools, which are giving advanced courses in air transport operation in conjunction with their most advanced flying courses. There are, however, certain limitations imposed by equipment and the need of adequate teaching staffs, and much of this instruction can only be handled at technical schools or at business schools of university grade. The flying school may well do what it practicably can, but the teaching of either business or engineering as a connected whole lies beyond its scope.—Ed.]

• • •

Salesmanship and Business

TO THE EDITOR:

I appreciate your article "Salesmen Not Pilots" on page eleven ninety-four in AVIATION of December 21, 1929, and heartily agree with your viewpoint. Therefore, I am writing you for information on the subject.

Salesmanship is my specialty and I consider it a profession rather than a means of livelihood. In the spring of this year I made inquiry as to various ways of entering Aviation and quite naturally my information from the schools was that the first thing I should do was—learn to fly. As a result of this I have spent approximately eight hundred dollars, and now have seventy hours solo time. I like to fly—to be sure—but my first interest lies in selling. It seems that most companies require a transport pilot to take out a ship for demonstrations—and I can understand the reason for this. But, on the other hand, it seems there should be some way of reconciling my years of salesmanship with my few hours in the air, combining the two experiences into a profitable occupation.

[Name Witheld by Request.]

• • •

The Same Question

TO THE EDITOR:

Reference is made to your article, "Salesmen not Pilots" in your December 21st edition, page 1194, in which you suggest a training school for the purpose of training salesmen to sell aviation, the writer would be pleased to have you advise whether or not such a school exists and if so, would appreciate it if you can put him in touch with such an organization.

Thanking you in advance and trusting that I may hear from you at your earliest convenience.

[Name Witheld by Request.]

[The above letters are of interest in conjunction with Mr. Voorhees' remarks upon the same subject. Special facilities for the training of salesmen are especially desirable in the aircraft industry and one school already devotes at least two classes monthly to instruct in this subject.—Ed.]

New Volumes
FOR THE SHELVES

Dutch East Indian Airports

ATLAS OF THE AERODROMES, LANDING FIELDS AND SEAPLANE STATIONS IN THE NETHERLAND EAST INDIES; *1929 by the Department of Government Industries, Civil Aviation Section, Bandoeng, Java.*

THE DISTANT Dutch East Indies have not been neglecting development of aviation facilities, according to a compilation of airport data recently received by AVIATION. This atlas, as it is called, goes into much detail relative to each airport recognized by the civil and military authorities and sets forth much the same information as the Airport Bulletins issued by the Aeronautics Branch of the United States Department of Commerce. It is used, of course, for the same purpose. One feature differentiating the Dutch publication from ours is the inclusion of actual aerial photographs of the airports and contiguous terrain, in addition to the two maps of the airport and of the surrounding territory.

The information is presented on pages 8½x11¼ in. in size. While fewer details are included, as compared with our Bulletins, the illustrations are larger than ours. For instance, Semarang Aerodrome on the island of Java is described for the benefit of the airman as follows (a photograph at the top of the page shows the terrain in excellent detail): Name—Samerang; classification—civil aerodrome; position—longitude 110 deg. 22 hr. 36 min. East, and latitude 7 deg. 0 hr. 44 min. South; height above sea level—230 ft.; communication—distance from Samerang about 6 mi.; dimensions—1,935x 1,840x750 ft.; main direction (prevailing winds SW-NE; description—sloping, grass; surroundings—hills; obstructions—petrol tower and hangar on east side; accommodations—hangar for civil service, gasoline pump, oil, wind indicator, restaurant, telephone.

The information is printed in two languages—Netherland and English. This is in deference to the practice of both English and Dutch interests to avail themselves of the K.L.M., the K.L.I.N. and other air services in operation throughout the island archipelago. Preceding the collection of airport data, there is a general description of the contents and a statement of the rules governing flights of foreign aircraft above the Dutch East Indian territory.

The aerial photographs were taken by the Netherlands East Indian Army Air Corps. The atlas is issued by the Head Civial Aviation Section at Bandoeng, Java, and supplements are distributed through that office as the Aeronautics Branch distributes the Airport Bulletins in this country.

Beside this airport data, survey maps of the islands are available. These include Java, Sumatra, Bangka, Bali, Lombok, Soembawa, Flores, Timor, etc. These are outline maps showing the location of the landing facilities in relation to each other and the principle settlements of the territory included in the may. Railroads and tramways are designated. Aerodromes are indicated by circles, emergency or other landing fields by a cross and seaplane stations by an anchor enclosed in a circle.

The atlas is attractively arranged. The essential details for operations in that territory no doubt are all given. Among the items lacking in a comparison with the United States Bulletins, is the extensive meteorological data, reference to attendants, various hangar, service and landing fees, means of transportation to the nearest community, overnight accommodations, repair equipment, etc. Because of its large size, one would expect it to be less convenient for general reference than the smaller American Bulletins.

A few statistics may be derived from this Atlas. There are 33 landing fields in Java, four of which are equipped with hangars, etc., and are classified as aerodromes. There are but three seaplane stations in that territory and they are all on the Java coast. Sumatra boasts seven landing fields, none of which are considered aerodromes. Flores has two fields and there is one each in Bangka, Bali, Lombok, Soembawa, and Timor.

All are of grass. The average size seems to be 1,800x300 ft. for the two-way emergency fields, which the majority of the landing fields are. Most of these are military. The four aerodromes are much larger, the aerodrome at Kalidjati, where the military flying school is located, being 3,000x3,000x 4,500 ft.

One of the most conspicuous aspects of these fields is the practice of marking the corners and center with wide white lines. There is no mistake about where the boundaries lie and it is probably most gratifying to the arriving pilot, especially if the landing is in the nature of an emergency, to see the limits of the field and the center so clearly designated.

Included in the collection are rules governing flights of foreign aircraft about the Netherlands East Indian Territory. —CHARLES H. GALE
AVIATION *Staff.*

Abstracts AND *Reviews*

British Progress

AERONAUTICAL PROGRESS IN GREAT BRITAIN, *By H. E. Wimperis. The Journal, R.A.S.; No. 226, Vol. XXXIII; October, 1929.*

ENGINES having compression ratios as high as 7 are proving as reliable as the earlier engines of lower ratios. The use of "dope" in fuel to delay detonation is being widely resorted to. On standard service engines a weight-power ratio of about 1.5 lb. per b.hp. is now being obtained. Much attention is being given to "in-line" type air cooled engines, for civil flying. The Cirrus and Gypsy engines of this type are representative of this class and have a normal period between complete overhauls of 400 hr. An 8 cylinder water cooled Diesel engine developing 600 hp. at 2,000 r.p.m. and with a fuel consumption of .40 lb. per b.hp. has completed satisfactory test. Operating on the two stroke cycle, an engine developing a brake mean effective pressure of 100 lbs. per sq.in. at 2,000 r.p.m. has been developed. The high speed sleeve valve engine has now reached the stage where it appears to be a practical possibility.

Metal construction is rapidly increasing. Much attention is being given to the strip method, i.e., the use of thin sheets of corrugated section. This method lends itself readily to mass production and shows marked saving in weight. In large sizes, for example, a strip steel fuselage is about 15 per cent lighter that the corresponding component in steel.

The use of zinc and cadmium deposits to prevent corrosion of metals has proved capable of useful application. Special attention is being given to the problem of welding the non-corrosive alloy steels, Y alloy forgings for pistons and cylinder heads is coming into wide use. The method of protecting aluminum and its alloys from corrosion by the formation of an anodic oxidation film is now much employed in this country. For the prevention of corrosion of magnesium a simple immersion has been evolved which, with the application of an appropriate enamel or grease, gives a fair measure of protection. The soundness and general properties of aluminum alloys can be substantially improved by the "pre-solidification" process or by treatment with nitrogen gas.

For the improvement of control at

low speeds, and even beyond the stall, favorable results have been obtained in the association of a Handley Page slot and normal aileron. The rotating wing type of aircraft offers possibilities for increasing safety. Going a step further than the Cierva autogyro, the Isacco helicogyre has a small engine and airscrew mounted on each of the four supporting blades. One such craft is being built and, if it flies at all, should be able to ascend and descend vertically.

Altimeters of reduced weight and size have been perfected, accurate to 100 ft. at 20,000 ft. A new airspeed meter weighs 11 oz. and is accurate to 2 m.p.h. at 240 m.p.h., over a temperature range of 70 deg. C.

Flow meters for fuel lines have demonstrated that a marked saving in fuel consumption results from their use.

Here as in other countries the short wave radio set is receiving attention because of the saving in weight and required power, and because of the advantage of the fixed aerial over the trailing type.

• • •

C. G. Grey on "Patriotism"

ON PATRIOTISM; *article by C. G. Grey in* The Aeroplane; *Vol. XXXVII, No. 21, Nov. 20, 1929.*

ON FREQUENTLY REPEATED OCCASIONS, Mr. Grey, in his capacity as editor of *The Aeroplane,* has taken the British aviation industry to task for failure to design and construct certain types of commercial planes which have proved popular in other countries and particularly in the British Dominions. Specifically, he has pointed out the success of American and other firms with single-engined cabin planes carrying from four to seven passengers. His suggestions have evidently not been very graciously received, and in the article under consideration he undertakes to set forth and justify his point of view. he says, "The patriotic course, as I conceive it, is to tell everybody in the British Aircraft Industry, and everybody who is interested in aviation not only in this country but all over the British Dominions and all over the world, just exactly what the position really is."

Primarily, he explains that he is interested in the development of aviation as an independently successful commercial operation, rather than as a luxury to be permanently subsidized by the government. To attain this end, he believes in free and vigorous competition in all available markets. He maintains, therefore, that it is more profitable to build airplanes to suit the demands of potential purchasers than to expect purchasers to take whatever they are offered. It is thus more honestly patriotic to present the best features of planes which are successfully sold throughout the world than it is simply to bestow indiscriminate praise on types which happen to be manufactured in his own country.

"At the moment," Mr. Grey writes, "the British Aircraft Industry is up against American competition. That is why I keep on acclaiming American progress. And, because he hates being waked out of his self-complacency, the British manufacturer and designer says that I am unpatriotic. . . .

"On the whole, there has not been much in it between the price of an airplane Amer. and the price of an aeroplane Brit. But where the American has scored, is that he has been able to supply the type of aircraft that people want."

In order to emphasize his points, he presents a careful analysis of the differences between American and British manufacturing tendencies, as exemplified forty years ago in the making of bicycles, more recently with automobiles. The American, he says, is progressive, enthusiastic, willing and anxious to experiment with new types and new production methods. He is also inclined to be somewhat wasteful both of energy and materials. The Englishman, on the other hand, is conservative, careful, apt to be satisfied with what he has until forced to adopt improvements. When he gets around to it, however, he is apt to do it very well.

In 1893, an American named A. A. Zimmerman went to England with a lightweight American bicycle, and won practically all the races in sight. Five years later, English firms followed American designs, and ten years later were producing bicycles more cheaply than their American rivals, in England at least. Similarly, the British developed a type of light automobile with high-speed engine which was suitable for English conditions, but which would not stand up under the rough treatment and bad roads likely to be found in British Colonies and other non-European countries. American manufacturers got most of the trade, and it is only recently that British competition in this field is beginning to make itself really effective.

Mr. Grey finds in the British aviation industry a similar tendency to ignore the demands of foreign markets, and he expresses a fear that in aviation, too, the English may waste about ten years catching up to the point from which they should have started. Specifically, he says that American methods of production of raw material and parts, particularly along metallurgical lines, are far ahead. Only in the production of military aircraft does he feel that his country is definitely superior. Otherwise, he warns his compatriots that the history of the cycle and automobile industries may be repeated in aviation.

"Obviously," he adds, "to make commercial aircraft at a profit we must make aircraft of sorts which can be sold in whatever market exists. And, except for two types of light aeroplanes, we have not sold commercial aircraft in big enough quantities to be worth considering.

"In support of these arguments I have constantly told our aircraft constructors what the American Aircraft Industry is making, and why American aeroplanes are being sold in such vast quantities, not only in the United States but in Canada. And I have published specifications and illustrations of those American aircraft so that our designers, senior and junior, may see what they are up against."

[We have devoted an exceptional amount of space to the foregoing abstract in view of the exceptional position that Mr. Grey holds in aeronautical journalism and of the importance of his personal expressions. We are glad to applaud his broad-minded attitude and willingness to recognize the merits of American products, and we hasten to add that such breadth should not be unilateral. In accord with Mr. Grey we hold to the intention of furnishing full information upon activities abroad, and of giving full credit to the achievements of foreign workers in the aeronautical field. We are proud of the performances and confident of the merits of American aircraft, as Mr. Grey is of those of British origin. We are confident that they can make headway against any competition that they are likely to meet, but it would be folly to claim a monopoly in merit for any country. When we feel that in some particular aspect of its development the American industry has been laggard, or that there is something that should be learned from abroad, we shall continue to call attention to the fact as forcefully as possible.—Ed.]

• • •

Airport Revenue

STANDARDIZATION OF AIRPORT REVENUE; *by Arthur H. Abel, assistant port manager and assistant chief engineer, Oakland Municipal Airport. Paper presented at the Western Airports Conference.*

ESTIMATING the gross revenue of the Oakland Municipal Airport for the fiscal year 1929-30 as between $60,000 and $80,000, Mr. Abel presents a careful and detailed analysis of the relative importance of various items of income, and gives the specific charges to account for each. Although the port was paid for out of a city bond issue, no money has been voted for its operation, and in addition to being self-supporting, it is expected to provide a sinking fund to cover depreciation of equipment, and something toward retirement of the bonds. Consequently, it may fairly be regarded as a strictly commercial venture.

The largest item of income, according to the report, is hangar rentals, accounting for 35 per cent.

Charges are from $35 per month or $1.50 per day for planes occupying less than 700 sq.ft., to $75 per month and $4.00 per day for planes occupying over 2,500 sq.ft. Space leased by the year to large companies accounts for 18 per cent of the gross revenues, including one sum of $14,000 as rental for a whole hangar.

A further 13 per cent is received in fees for commercial operations, ranging from $30-$45 per month, winter and summer, for a two-passenger plane, to $70-$90 for a plane carrying over six passengers. In order to protect local operators, charges ranging from $33 to $69.50 per day are made for the commercial operation of transient planes.

Twelve per cent of the total revenues is derived from rental of shop and office space at five cents per square foot. With this is included $5,300 annual rent paid by one company which furnishes a public repair service in half of one hangar. The 37-room inn, erected at a cost of $55,000, is leased for 7 per cent of that amount per year, plus 10 per cent of the total amount taken in by the management. This furnishes 9 per cent of the airport revenue, and an additional 7 per cent comes from the restaurant concessionnaires, who pay 10 per cent of their gross receipts, with a minimum guarantee of $425 per month. The inn and the restaurant are the only exclusive concessions on the airport.

Six companies selling gasoline and oil, with one company selling oil only, pay the management one cent for every gallon of gasoline sold, and five cents for each gallon of oil. These companies have all installed their own underground tank equipment. At present they furnish 5 per cent of the port revenue, and this percentage is expected to increase materially as the use of the airport increases.

A charge of $2 per hour or fraction of an hour is made for lighting the field with small floodlights, and $3 per hour or fraction for lighting with the large B.B.T. floodlight. Hangars are supplied with illumination for $0.25 per hour. These charges are based as closely as possible on actual cost, as 2 per cent of the total revenue is required to pay for electricity. The remaining 1 per cent of the total is received from rentals for lockers and tool boxes, vending machines, and commissions on telephone and telegraph receipts at the field. The U. S. Government pays $100 per year for the airport Post Office.

Maintenance of the airport costs about $7,500 annually, of which $6,000 pays for lighting and operation of drainage pumps. The staff consists of a superintendent, stenographer, clerk, building and field janitors, and five service men, with a total annual payroll of $18,720. At the time Mr. Abel prepared his report, the city was receiving a net profit of about $2,000 per month from the airport. A summary of the various sources of revenue is given below:

	Per cent of total
Hangar rents	35
Leases	18
Fees for commercial operations	13
Rentals of shop and office space	12
Inn	9
Restaurant	7
Gasoline and oil sales	5
Electricity charges	2
Miscellaneous	1

New Patents

Metal Covering for Aircraft

1,740,492. JOINT CONSTRUCTION FOR METAL PLATING OF AIRSHIPS. ANTHONY W. AGLER, Los Angeles, Calif. Filed March 9, 1929. Serial No. 345,630. 6 Claims. (Cl. 244—31.)

INSTEAD of riveting together the thin plates which form the covering of metal air-craft, this construction calls for intermeshing rolled edges. It is claimed that owing to vibration rivets work loose and the rivet heads frequently pull through the plates. Each pair of cover plates is spaced apart and joined by a curved tension plate which is designed to flatten out or become increasingly curved as the cover plates contract or expand due to temperature changes. Each tension plate is of wedge-shaped construction so that by drawing it in or out of the joints which connect it to the cover plates it is intended to draw the cover plates together or spread them apart to tension or slacken the metal covering. For this purpose adjusting studs and nuts are provided between the fixed frame of the craft and the movable tension plates.

• • •

Electrically Heated Fabric

1,741,054. ELECTRICALLY-HEATED FABRIC AND THE LIKE. WALTER D. GRAHAM, River Forest, Ill. Filed Oct. 11, 1926. Serial No. 140,882. 7 Claims. (Cl. 219—46.)

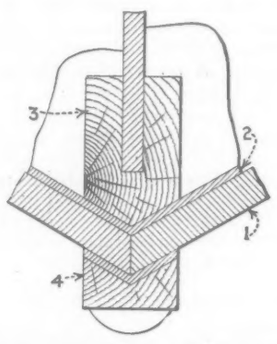
AN ELECTRICALLY-HEATED FABRIC for such purposes as aviator's suits is formed by varying the ordinary weaving construction wherein each warp and weft alternately passes above and below the members which it crosses. Provision is made for certain warps to skip one or more wefts at definite intervals in order to provide loops through which electric heating wires may be passed. After the electric wires are in position, the fabric may be enclosed within cover sheets attached to its surfaces.

• • •

Seaplane Float

1,740,846. IMPERVIOUS SEAPLANE FLOAT. CHARLES A. VAN DUSEN, Cleveland, Ohio, assignor to The Glenn L. Martin Company, Cleveland, Ohio, a Corporation of Ohio. Filed May 15, 1926. Serial No. 109,397. 6 Claims. (Cl. 244—2.

IN ORDER to secure a float (which may be a seaplane float, flying boat hull, or speed boat) that is impervious to moisture, the entire frame-work is covered by a skin formed of a material described as "vulcanized cellular hard rubber blown approximately 140 per cent in the heating and hard vulcanizing process to form a minutely cellular structure." This material has vulcanized upon its inner and outer surfaces cotton or cotton duck. In addition, each joint of the frame has interposed between the jointed members continuous strips or sheets of soft rubber which are clamped in position by the jointed members themselves or by clamps provided for the purpose.



The illustration shows bottom skin 1 of hard rubber, and soft rubber strip 2 clamped in position between keel 3, and false keel 4.

• • •

Frame for Rigid Aircraft

1,740,839. CARRYING BODY FOR RIGID AIRSHIPS. ERNST RUESS, Munich, Germany. Filed Oct. 2, 1928. Serial No. 309,724, and in Germany June 14, 1926. 6 Claims. (Cl. 244—3.)

THE FRAME of a rigid airship is formed by sets of spaced C-shaped channel rings. Each set is composed of two concentric C-shaped rings, one smaller than the other, positioned back to back and joined together by suitable bracing. The sets may be spaced several metres apart and joined by bracings lengthwise of the frame. Among the advantages claimed for this construction are greater resistance to stresses, and large, uninterrupted gas cell space.

THE BUYER'S LOG BOOK

Aero Fire Extinguisher

AIRCRAFT Safety Devices, Inc., Cleveland, Ohio has recently introduced the Aero pistol type fire extinguisher. This device is made in the one quart size and contains aero fluid having a carbon tetrachloride base. It operates like a pistol, discharging a gasified stream which expands 3,600 times on contact with heat and is a non-conductor of electricity. Capsules of carbon dioxide under pressure sufficiently strong to throw a stream 35 feet furnish the propelling force.

Mounted in a jarproof bracket, the discharge orifice nozzle fits into the fluted end of flexible tubing having three discharge outlets, one to the carburetor, one into the draft stream at the front of the motor, and one to the manifold.

Aero gun extinguisher

This makes it possible for the pilot to discharge the contents into the motor compartment with one hand without removing the extinguisher from the bracket. An inside valve allows it to be operated in any position.

Carrier Vapor Degreaser

THE Carrier Engineering Corporation, Newark, N. J. has recently developed a new vapor bath process for the degreasing of metals and other impervious materials. In this process a solvent known by the trade name of Cecolene is boiled and vaporized. In the standard tank form of the apparatus the vapor rises to the level of water-cooled condenser coils around the sides near the top of the tank, is condensed and precipitated to the bottom of the tank. Since the vapor is more than three times as dense as air, there is no tendency to overflow or escape.

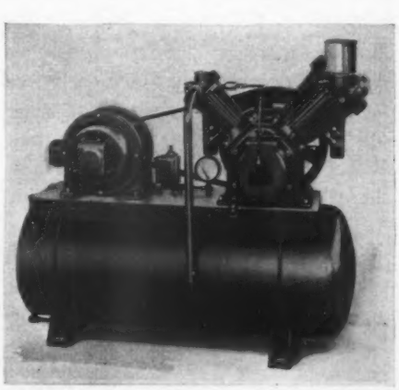
The objects to be degreased are suspended in the vapor, which condenses on their cold surfaces and runs off, carrying with it all grease. The objects are kept in the vapor until they heat up to its temperature, in from 1½ to 3 min. The time depends on the gauge or weight of the metal. They are then removed in a warm, dry and clean state, any foreign matter remaining being in the form of dust easily removable. Objects being degreased do not come into contact with grease previously removed from other material. The chlorinated solvent can be used over and over, the vapor never becoming dirty.

The vapor degreaser will be commercially available in standard dip tank units and in special designs adaptable to any size or style of continuous conveyor in line assemblies, and to steam, gas or electric heating.

Ingersoll Rand Compressor

A NEW LINE of air-cooled, two-stage air compressors known as Type 30 is announced by the Ingersoll-Rand Company, 11 Broadway, New York City. In the new design a V-type belt drive is employed and both motor and compressor have ball bearing. The units are self-contained, the motor and compressor being mounted on a steel base attached to the top of the air receiver, which is made of heavy pressed steel to withstand a working pressure of 200 lb. With this arrangement, no special foundation is required for correct alignment of the compressor and motor.

The intercooler is located behind the fantype flywheel and a constant current of circulating air is driven directly across the cooling coils, reducing the temperature of the discharge air. Automatic start and stop control, furnished as standard equipment, operates independently, but in conjunction with the unloader. When the pressure in the air receiver reaches a point at which the regulator is set to unload, the motor is automatically shut off. A centrifugal governor allows the air in the high pressure cylinder and intercooler to exhaust through the crankcase. This prevents the compressor from starting against a load.



Type 30, air cooled, two stage compressor

Honed cylinders and two oil control rings reduce the oil in discharge air to a minimum. Each piston is run into its respective cylinder, insuring a perfect oil seal. The base of the compressor unit forms a reservoir for the oil, no oil pump being required, and a bayonet gauge gives positive indication of the amount of oil in the reservoir.

An air cleaner keeps dirt out of the compressor and requires no attention. Less floor space is required for the new compressor and power is reduced from 10 to 30 per cent. It is made in four sizes, ¼, 1½, 3 and 5 hp., all sizes being built for a working pressure up to 200 lb. continuous duty.

TRADE CATALOGS

SPARTAN AIRPLANES. The Spartan Aircraft Company has recently published a catalog describing their factory equipment and the organization of the Spartan Company and school. Special features and specifications of the C-3-165 and the Wright Whirlwind Five engine are presented. The booklet is highly illustrated, particularly the concluding section devoted to the advertising schedule of the company in 1930.

DIAMOND TOOL BORING. The Automatic Machine Company announces the publication of a series of engineering data bulletins on Diamond Tool Boring, beginning January, 1930. The bulletins will be loose leaf and will include a binder for filing.

AMERICAN STEEL & WIRE COMPANY. "Around the World With the Graf Zeppelin" is the title of a folder recently issued by the American Steel & Wire Company, subsidiary of United States Steel Corporation. The folder is descriptive of the part played by this company's products in the voyage of the Graf Zeppelin and also in the explorations of Commander Byrd. The most important products manufactured by the company are listed.

Engine Parts

THE Frank G. Buffum Manufacturing Company, Louisiana, Mo., manufactures engine parts for practically all discontinued motors such as the Curtiss OX-5, Hall-Scott, Mercedes and Hispano-Suiza. Hardware items including turnbuckles, shackles, bolts, clevis pins and ferrules are also supplied by this company.

SIDE SLIPS

By
Robert R. Osborn

THE HOLIDAY SEASON jumped on us so suddenly this year that we almost forgot to make our annual resolution: We hereby resolve to get our "Side Slips" copy in to the Editor on time during 1930.

[Editor's Note: We've printed this resolution every year now, but don't let it fool you,—the copy will probably be later than ever.]

[Author's Note: Is zat so? We had it in on time twice in 1929.]

[Editor's Note: It was in on time twice,—once when there was a holiday and we published a day late, and once when the copy was so late one week it was on time for the next.]

[Author's Note: Shucks!]

• • •

Someone sends in the following clipping from the New York *Herald-Tribune* "Catersville, Ga. Dec. 16th—Mrs. Rebecca Latimer Felton, former United States Senator from Georgia, has enjoyed a new thrill—her first trip in the clouds. Mrs. Felton yesterday was a passenger aboard the Vigilante, *semi-rigged* dirigible of the Goodyear Corporation, and on alighting after her first ride in an airship declared she was thrilled."

There is no thrill, though, to equal one's first ride in a semi-rigged airplane.

• • •

We see that one of the air lines has reduced its rates to equal that of the Pullman fare in an attempt to interest traveling salesmen in the service. Judging by the traveling salesmen stories we have been hearing for some time it will be a good thing for the morals of the country to get them into the big cities as quickly as possible and keep the traveling salesmen out of the farming districts.

• • •

THIS WEEK'S ASTOUNDING AERONAUTICAL EVENT

The following news item appeared in the *Evening Tribune* of San Diego, Cal., "Alemeda-Amelia Earhart, trans-Atlantic flyer, arrived at the Alemeda Airport at the controls of a Tri-motored T.A.T. Maddux air liner, carrying seven others from Los Angeles."

• • •

Since our comments a few weeks ago on the news that a cow had eaten the rudder off of Mr. Richard Hoyt's ship when it was parked in a pasture overnight, we have had a number of letters which show that cows are quite fond of Grade A cotton when treated with the right dope, in fact, they seem to be so fond of it that this occurs to us as a good solution for the problem of our excess airplane stocks,—they might be run through the cutters and blown into the silos. One interesting letter on cows' diets comes from J. L. Echols, of San Antonio, Texas:

"That incident to Mr. Hoyt's ship provokes a laugh, but it is certain he is not familiar with "cow country." Down here in Texas you can't find a barnstormer who is not aware of the cows' appetite for dope. In 1920 I had a three-Jenny circus on the road and I became fully familiar with the subject at El Campo, Texas. My "grease-monkey" night watchman dozed off to sleep and I arrived at the field to find the tail groups and wing tips of all three ships completely gone. Either fortunately, or unfortunately, the right wing of my personal ship had undergone some patching the day before and the fresh dope set up a severe case of indigestion in two of the animals, from which one died a few days after we had finished our engagement there. I was promptly sued by the farmer for having set up such an unsavory or unhealthy menu for his herd. The suit didn't get anywhere, however, because his lawyer soon learned that all those fifteen dollar riders we were taking up must not be all velvet,—as I am told that he related to his client that "those flying circus fellows had no money,—whereupon his client asked "When did they go broke?" The answer was that they never "went" broke, they just "stayed" broke.

On a trip to the Argentine, from which I have recently returned I learned that a cow is just a cow anywhere in the world. Flying for a British stockman,—we spent the night on one of his ranches near Toay,—200 miles northwest of Bahia Blanca on the P.P. Ry. and about 500 miles southwest from Buenos Aires. During the night several strays from the herd broke down the frail stockade I had built around the crate and nibbled at wing tips, rudder and stabilizer. Grazing is good and plentiful there,—right on the edge of the Pampas,—but nevertheless,—they will forsake good grass for dope anywhere in the world.

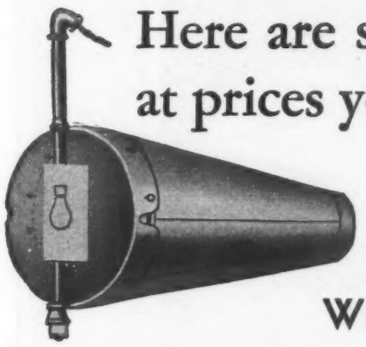
• • •

You may remember that one of the airplane manufacturing companies actually made some money a year or so ago,—by lending their capital stock subscription money to the Stock Market as call money, at the high rate of interest which was prevailing at that time. Now, Mr. R. B. of Tacoma, Wash. sends a clipping from a financial journal about another aeronautical venture which is making money:

"San Francisco *(Examiner)* Dec. 12: Kansas City, Kansas, 12/11. The first cash dividend ever paid on common stock of an airport in the U. S. was declared by directors of Fairfax Airports, Inc. of Kansas City today, when they authorized the payment of 25c on each share. Dividend represents profits from the sale of natural gas from fourteen wells on the field."

GET THESE NOW

Here are seasonable items—universally needed—at prices you can't resist. Now is the time to avail yourself of these splendid bargains!



Johnson Wind Cones

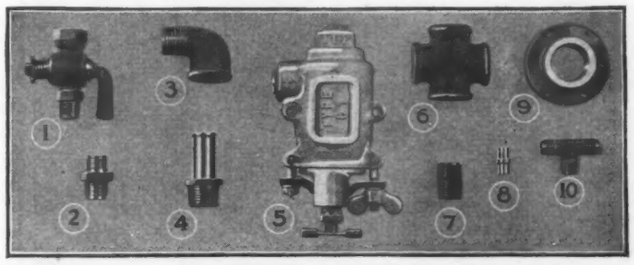
Here are quality wind indicators. Not made from dyed materials which rapidly fade in weather; we spray the goods in the cone with a mixture of chrome yellow that preserves the materials and makes the color last. Style 2 shown above, Department Commerce Standard, internally lighted. Heavy and durable in construction; suspended from a tower or mounted on ¾-in. pipe standard; reflector moves with cone, light and wiring remaining stationary. Cone, fittings, lighting fixtures, complete $53.00. Cone only . **$9.00**

Johnson Flying Suits

The Commercial Ace No. 34 Suit is an exceptionally fine winter suit at a moderate price. Olive drab, water proofed, sheepskin cloth; lined throughout with wool sheepskin; wide fur collar; zipper fasteners; large pockets; sizes 36 to 48; price only $60.00.

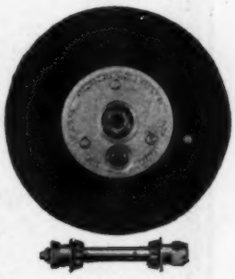
Johnson's Special Winter Flying Suit No. 37 is similar to No. 34 except has a beautiful wool blanket lining. Not quite as heavy, but exceptionally warm and comfortable—and priced at a genuine bargain at only **$35.00**

Cone Style No. 3, Department of Commerce Standard for airports of A-1-A rating—36 in. x 12 ft., cone only $12.00. Same cone with fittings.. **$20.00** « « «



FITTINGS—1. *Shut-off Cock;* 2. *Union Nipple;* 3. *Street Ell;* 4. *Hose Nipple;* 5. *Fuel Line Strainer;* 6. *Plain Cross;* 7. *Pipe Nipple;* 8. *Hose Liner;* 9. *Riveting Flange;* 10. *Union Tee.*

Johnson Tail Wheel



Built to stand the gaff but simple in design and easy to assemble. Three big advantages—(1) Lightest weight on market; (2) Lowest prices; (3) Only tail wheel Timken equipped to take radial or side-load. Two popular sizes, 14 x 3 in. (which also takes 16 x 4 in. tire), and 10 x 3 in. (which also takes 12 x 4 in. tire).

Think of Johnson First...

as a dependable source of supply for everything aeronautical. Dependable in quality, price and service. Strict accordance to government standards. Being both manufacturers and distributors, we can supply your needs in practically every line. Write today for your copy of our big free catalog or send us a trial order—see what Johnson service means!

JOHNSON
AIRPLANE & SUPPLY CO.
DAYTON, OHIO

541 West Douglas Avenue
Wichita, Kansas

224 East Eleventh Street
Los Angeles, Cal.

MAIL THIS!

Johnson Airplane & Supply Co.
Dayton, Ohio

Ship me the following items as described in this ad—satisfaction guaranteed or money back:

_____

_____

_____

*Remittance enclosed for $*_____

Also send me your big, free catalog.

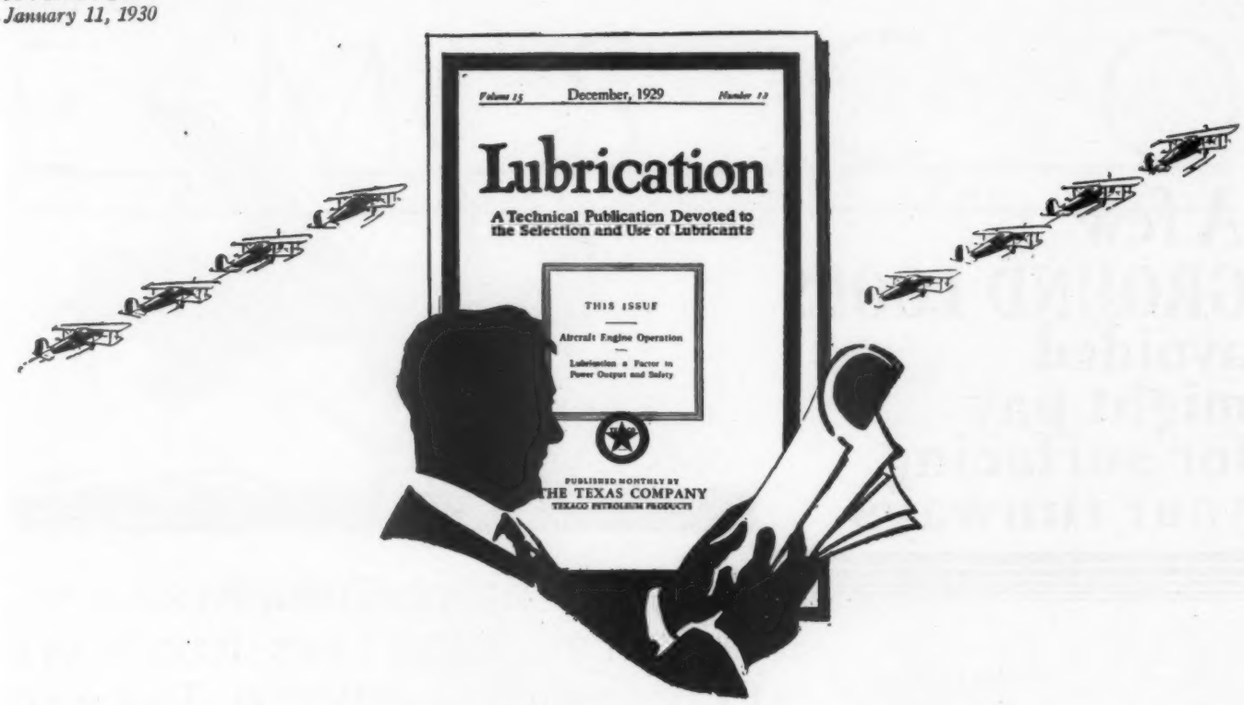
*Name*_____

*Address*_____

Translating a Vision into Brick and Steel

THE new home of The Glenn L. Martin Company which is rising on the outskirts of Baltimore is the crystallization of a dream—a dream of a place where a group of aeronautical engineers and artisans will be able to live, labor and plan in surroundings conducive to the greatest mental stimulation and the most effective performance.

THE GLENN L. MARTIN CO.
Builders of Quality Aircraft since 1909
BALTIMORE, MARYLAND


Volume 15 December, 1929 Number 12
Lubrication
A Technical Publication Devoted to the Selection and Use of Lubricants
THIS ISSUE
Aircraft Engine Operation
Lubrication a Factor in Power Output and Safety
PUBLISHED MONTHLY BY
THE TEXAS COMPANY
TEXACO PETROLEUM PRODUCTS

The Aircraft Engine

. . . *its care and lubrication*

The December issue of The Texas Company's monthly magazine "Lubrication," is devoted wholly to the subject of effective aircraft engine lubrication. It contains a most interesting and complete discussion of this vital subject.

This issue, while the edition lasts, will be sent free to all who write for it.

The Texas Company stands out in the field. Its own planes are constantly touring the country. Texaco Aviation Gasoline, Texaco Airplane Oils and Texaco Marfak Greases are available at the important landing fields in every State. The Texas Company was the first to provide aerial service stations. The Texaco Red Star with the Green T stands for progress and safety in the air. Write The Texas Company. Use the coupon for your copy of the December "Lubrication."

TEXACO AVIATION GASOLINE

TEXACO AIRPLANE OILS

TEXACO MARFAK GREASES

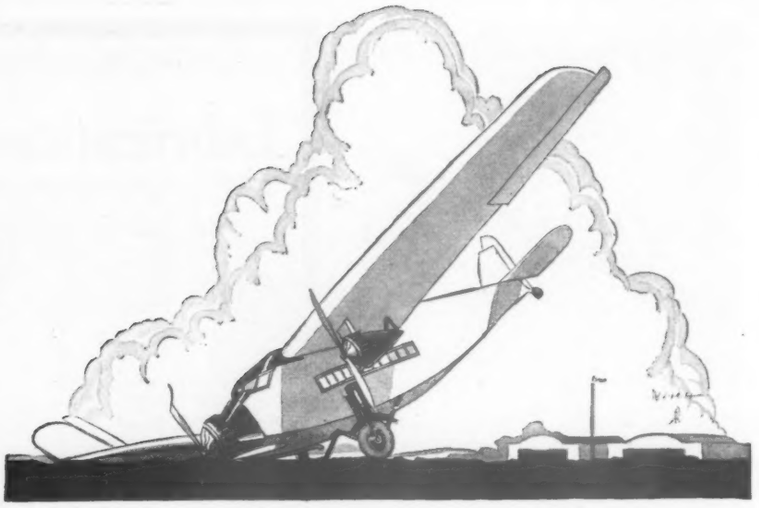
THE TEXAS COMPANY
17 Battery Place New York City

TEXACO
REG. U.S. PAT. OFF.

THE TEXAS COMPANY, 17 Battery Place, New York City
Please send me a free copy of the December issue of Lubrication.

Name_____
Street_____
City_____
State_____

A few GROUND LOOPS avoided might pay for surfacing your runways



YOU CAN BUILD FIRM, RESILIENT, MUDLESS, DUSTLESS RUNWAYS ECONOMICALLY WITH TARMAC

Pilots flock to airports where Tarmac-surfaced runways provide year-round all-weather take-offs and landings.

Tarmac runways make landings safer.

They make take-offs faster and more certain.

They enable you to keep your airport operating all year round and avoid the seasonal tie-ups.

They inspire public confidence in the safety of air travel.

Moreover, they can be built without great outlays of money. Tarmac {a scientifically-prepared coal tar which is carrying heavy traffic on such highways as the Lincoln, William Penn and National Highways} can be used with locally-available materials to build your runways, landing strips, taxi strips, hangar aprons, etc., at relatively low cost.

Let us send you information about the use of Tarmac for your airport paving.

Close-up of a Tarmac surface, showing its granular, skid-proof impervious nature.

AMERICAN TAR PRODUCTS COMPANY

Division of The Koppers Company

General Offices: PITTSBURGH, PA.

New England Division: Tar Products Corporation, Providence, R. I.

Plants:

Chicago, Ill.	Utica, N. Y.	Providence, R. I.	Follansbee, W. Va.
Milwaukee, Wis.	Birmingham, Ala.	Kearny, N. J.	St. Louis, Mo.
Youngstown, O.	Hamilton, O.	St. Paul, Minn.	New Haven, Conn.

Tarmac

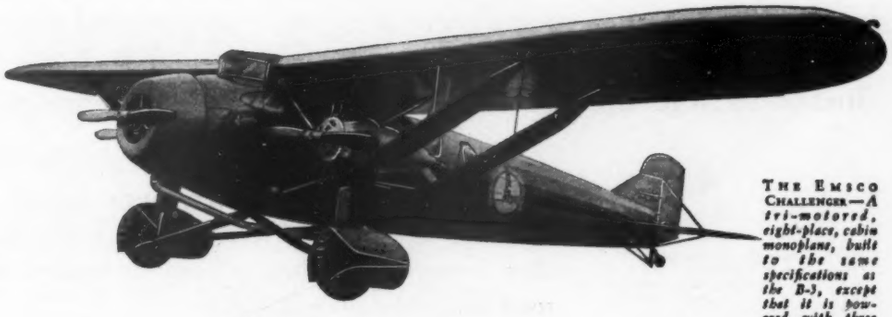
FOR GOOD AIRPORT PAVING

EMSCO

A COMPLETE LINE OF AIRCRAFT FOR LAND AND SEA

THE EMSCO CIRRUS—*A two-place, sport and training, mid-wing monoplane, powered with a 95 h.p., four-cylinder, air-cooled American Cirrus motor.*

THE EMSCO B-3—*A single motored, eight-place, cabin monoplane transport that may be powered with a Wright 300, a Pratt & Whitney Wasp or Hornet engine.*



THE EMSCO CHALLENGER—*A tri-motored, eight-place, cabin monoplane, built to the same specifications as the B-3, except that it is powered with three Curtiss Challenger engines of 170 h.p. each.*

EACH A LEADER IN ITS CLASS

Engineered on sound principles that have been proven by years of experience in commercial and military aeronautics.... Built by master craftsmen in a new $1,000,000 factory equipped with the most modern approved production methods.... These three types of Emsco Aircraft are proving every day their superiority in providing safe air transportation with greatest economy.

The Emsco Cirrus has flown cross-country under normal flying conditions with a fuel consumption of only 4.8 gallons per hour at cruising speed. Twice the 3-B, powered with a 300 h.p. Wright Whirlwind has taken off a gross load of approximately 10,000 pounds with a run of a half mile. The Emsco Challenger has demonstrated its dependability, safety and economy by flying more than 25,000 miles under all conditions, within the last four months.

In addition to these, the Emsco Aircraft Corporation has under construction at this time four new and distinctive types of planes, which, when completed and added to the present group, will make the Emsco line one of the finest and most complete in the industry today. These four include:

(1) a four motored plane carrying thirty-two passengers, two pilots and radio man; four Wasp motors—tandem; designed for all weather conditions and altitude flying, also offering economical transportation.

(2) The Emsco Amphibian—a bi-motored eight place, streamline, metal designed; built for heavy duty transportation.

(3) The Emsco Mail—a single motored monoplane, built for mail, express and freight; fast performance with a pay load of 1200 pounds.

(4) A special long range monoplane—extremely streamlined, designed for record distance flight.

All Emsco land planes are delivered from the factory with pontoon fittings so that no structural changes are necessary to quickly adapt them to seaplane work. The B-3 may easily be transformed into a tri-motored plane as fittings for outboard motors are standard. Structurally the planes are identical.

Complete specifications, performance data and prices will be forwarded on request.

EMSCO AIRCRAFT CORPORATION ◆ DOWNEY ◆ LOS ANGELES COUNTY ◆ CALIF.

This is one of a series of advertisements directed originally to advertising men in an effort to make industrial advertising more profitable to buyer and seller. It is printed in these pages as an indication to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial virility.

Is your copy keeping step with your salesmen?

AN eastern manufacturer selling a product for general industrial use has advertised consistently in six McGraw-Hill publications. His sales year after year have been so satisfactory that he has readily renewed his advertising contracts.

The product is staple — one of those prosaic things that make copy writers age prematurely. A new competitive situation came up last fall that made the copy obsolete. The advertising writer left his copy desk and turned salesman for a while. He returned with a sharpened pencil and a new viewpoint.

The new copy has been running now for several months. No change in advertising schedule! No change in sales policy! No change in product design or service! Nothing has been changed except the copy, which has become more sales-like and more humanly interesting.

NOW comes the president's report on sales for the first quarter. Does it not show that it pays to scrutinize copy as well as the mediums that give it voice?

THE REPORT*

I am inclined to believe that the new type of advertising is getting the results we had hoped for. In fact it is coming much better than we had reason to expect. We are very busy in the plant at the present time and our sales for the first quarter are running 35% higher than former years, which is quite a jump. The particular class of work we went after in this advertising has necessitated our practically doubling the machinery in this department and it is now operating on a 24-hour schedule.

**Extract from a personal letter covering several subjects.*

McGRAW-HILL PUBLICATIONS

New York Chicago Cleveland Detroit Philadelphia St. Louis
Greenville San Francisco Boston London

F-18

When You Teach Him to Fly—

Sit Side-by-Side in an

INLAND SPORT MONOPLANE

"TOMORROW'S PLANE TODAY"

This actual photograph shows how easily student and instructor may converse while flying in an Inland Sport.

No airplane is better for training than the high-wing, two-seater Inland Sport Monoplane. Its side-by-side seating arrangement enables instructor and student to talk face-to-face in ordinary tones, even while flying at high speed.

The instructor can point directly to the controls which the student operates . . . can touch them if necessary. There's no need for bothersome head-phones . . . no necessity for pantomine and a complicated code of signals to "keep her nose down" and so on. The instructor simply tells the student what to do . . . and he does it.

If the student makes a mistake, the instructor can correct him instantly. This eliminates waste of time . . . saves coming back down while instructor and student "talk it over" . . . saves the operation of an idling motor during such conferences . . . and best of all, reduces to a minimum the possibility of accident. Seated side-by-side in the same cockpit with the student, the instructor can correct serious blunders before disastrous results occur.

Sturdily built, the Inland has the strength and ruggedness to withstand the hard usage of student training. It will take the bumps like a gentleman . . . absorb shocks without serious injury to its nervous system.

Above all, the Inland is economical to own . . . economical to operate. It enables schools to train students at less cost and in less time per student than normally . . . or else, to train *more* students in the same length of time with your present staff of instructors.

Powered with a LeBlond 60 or Warner Scarab engine, the Inland is a small, low-price sport plane with few equals in refinement of design, beauty of line and color, performance and reliability. May we send you further details?

Manufactured at Fairfax Field under Approved Type Certificate No. 259

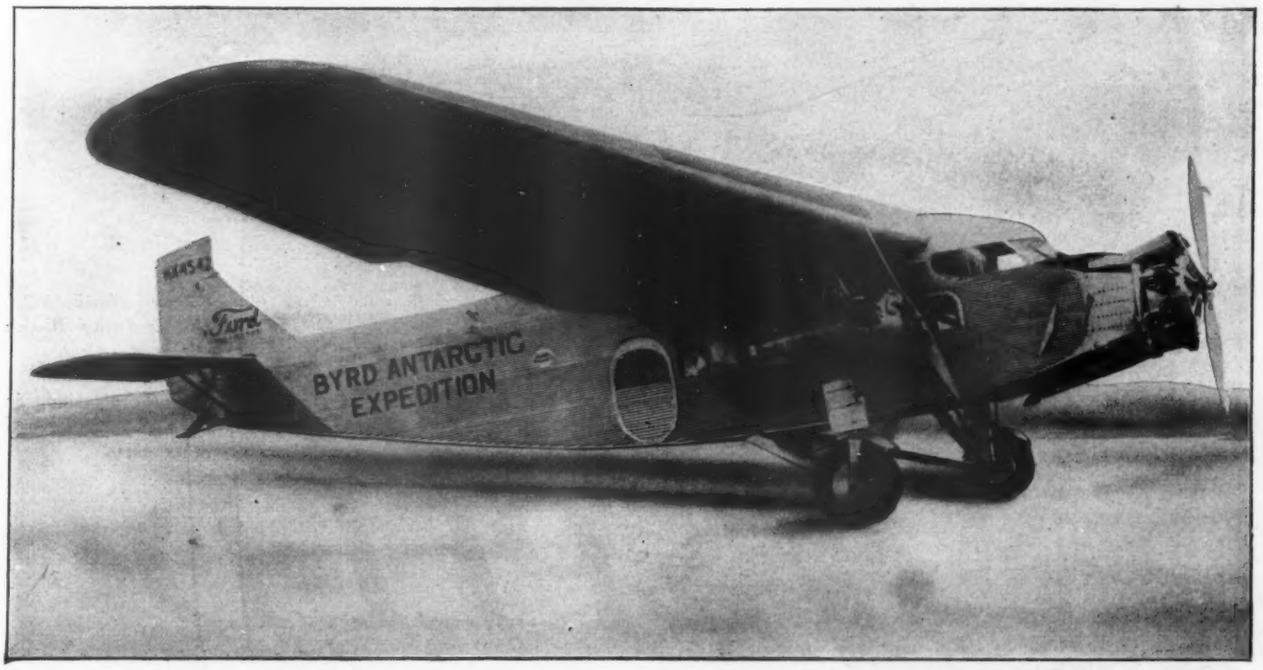
USING a stock model Inland Sport, Lt. Willfred G. Moore recently set a new American light-plane record for altitude . . . and later, in the same Inland, set a new world's speed record for light planes over a closed course.

INLAND AVIATION CO.

Fairfax Field, Kansas City, Kansas

SPONSORED BY AERONAUTICAL CHAMBER OF COMMERCE OF AMERICA, INC.
INTERNATIONAL
AIRCRAFT
EXPOSITION
1930 is the "Year of Merchandising" in Aviation. Today the Industry enters a new stage. Questions of performance, of manufacture, and of finance, have already been met and answered. Now we must learn to Sell! On this problem the keenest minds are centered. Its solution will be reached at this great Show. Here, the massing of all the physical achievements of the Industry, a vast Pageant of Transportation, the gathering of thousands of interested prospects, and Merchandising Conferences of far-reaching importance make this Major Aeronautical Exposition of the year an event of utmost importance. The world's Aviation leaders and an army of prospective dealers will be there. Will your product be represented? There is still time to reserve space by communicating immediately with — *Cliff W. Henderson, Manager, Aircraft Show Section*
AERONAUTICAL CHAMBER OF COMMERCE OF AMERICA,
INCORPORATED
St. Louis Office, Suite 242
Hotel Jefferson
SAINT LOUIS, MISSOURI
FEB.
15-23
1930
WORLD
AIR FAIR
ST. LOUIS ARENA

In Byrd's polar plane



FEW aircraft engines have ever been called upon to face the hazards encountered during Admiral Byrd's South Pole flight.

Intense cold, unusually lofty flying altitudes, high speeds, a very heavy load—these were some of the conditions met and overcome by the Wright Engines of the tri-motored "Floyd Bennett" during the remarkable 19-hour flight above the frozen wastes of Antarctica.

Like the engines that have driven so many other planes on memorable flights, these engines had vital parts made from Bethlehem "Airplane Quality" Steel Forgings, including the eight connecting rods and rocker arms of the Wright Cyclone Engine, and the eight connecting rods, master connecting rod and rocker arms of the two Wright Whirlwinds.

In ordinary cross-country flying, just as in climbing over the wind-swept Polar Plateau, airplane engines require steels that are as strong and enduring as it is humanly possible to make. You can place full dependence on Bethlehem "Airplane Quality" Steels and Forgings. They meet every test.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, and Honolulu.

BETHLEHEM
"AIRPLANE QUALITY"
STEELS ▪ FORGINGS

Curtiss Hawk P-3A U. S. Army Plane equipped with HASKELITE aircraft plywood in wing rib web and other parts.

PLYWOOD
HASKELITE
PLYMETL

SPEED ››

—through the terrific stresses induced, makes a plane its own testing laboratory.

In the fastest planes you'll find HASKELITE, the blood-albumin glued aircraft plywood. Data sent on request.

Haskelite Manufacturing Corporation

120 South LaSalle Street, Chicago, Illinois

Railway & Power Engineering Corp., Ltd.
Montreal, Toronto, Winnipeg, New Glasgow

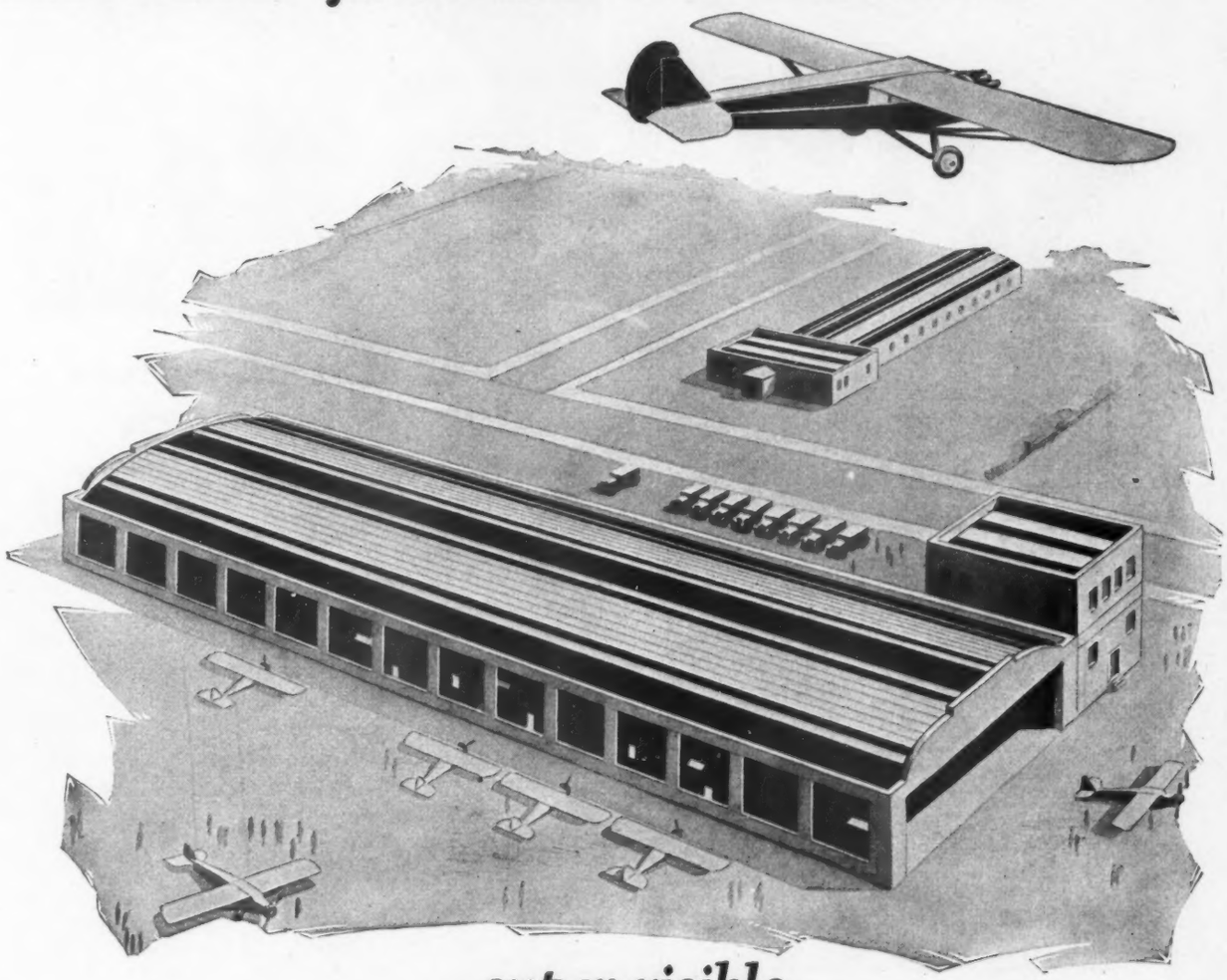
Air Associates, Inc.
Curtiss Field,
Box 333, Garden City, L. I.

California Panel & Veneer Co.
955 S. Alameda Street,
Los Angeles, Calif.

Cutter, Wood & Sanderson Co.
222 Third St., Cambridge, Mass.

A 1-11-Gray

AS SEEN *from the* COCKPIT...



—*super-visible, super-durable,* this Carey "*aeronautic*" Roof!

This drawing shows how it looks from the air, the Carey Roof designed especially for service in the aviation field. Meeting every exacting requirement of arched roof construction—offered in contrasting colors to give added visibility. Elastic, tensile-tough, extra-strong. Carey-laminated; built up, layer upon layer. The Carey "aeronautic" Roof—the roof which repays its original cost, many times over, in extra years of service.

May we tell you more about Carey Roofing Specifications for the Aviation Building? Write.

THE PHILIP CAREY COMPANY
Lockland, CINCINNATI, OHIO

FOR AVIATION FIELD SERVICE:

Carey Elastite Expansion Joints for runways
Carey Corrugated Asbestos Roofing and Siding for Fire-proof Buildings
Carey Asbestos Heat Insulation Materials

PHILIP Carey PRODUCTS

Safe!

Where there is no landing there must be no failure.

For SPRINGS of any kind, of any material, for any purpose in motor, controls or landing gear, use

GIBSON-SPRINGS

WM. D. GIBSON CO.
1800 Clybourn Avenue
CHICAGO, ILL.

SEND FOR OUR CATALOGUE

Saves skilled hands for repair work

CLEANING is costly when highly paid mechanics must spend valuable time scrubbing and scraping.

Get away from this wasteful practice . . . leave your men free to do more actual repair work . . . by using Oakite materials and methods. The powerful cleaning action of Oakite materials, used in spray equipment or tank, quickly loosens grease, grime, and burnt on exhaust oils from motor parts, wings and fuselages. Then a brief rinse leaves surfaces spotless and film-free, ready for inspection or reassembly. Time is saved . . . scrubbing reduced to a minimum.

Find out how Oakite materials can be profitably employed in your maintenance work; how they will help you get your planes back into the air more quickly. Our nearest Service Man will be glad to explain. Just drop us a line.

Manufactured only by

OAKITE PRODUCTS, INC., 14H Thames St., NEW YORK, N.Y.

Oakite Service Men, cleaning specialists, are located at

Albany, N. Y.; Allentown, Pa.; *Atlanta, Altoona, Pa.; Baltimore, Battle Creek, Mich.; *Boston, Bridgeport, *Brooklyn, N. Y.; Buffalo, *Camden, N. J.; Charlotte, N. C.; Chattanooga, Tenn.; *Chicago, *Cincinnati, *Cleveland, *Columbus, O.; *Dallas, *Davenport *Dayton, O.; Decatur, Ill.; *Denver, *Des Moines, *Detroit, Erie, Pa.; Fall River, Mass.; Flint, Mich.; Fresno, Cal.; *Grand Rapids, Mich.; Harrisburg, Pa.; Hartford, *Houston, Texas; *Indianapolis, *Jacksonville, Fla.; *Kansas City, Mo.; *Los Angeles, Louisville, Ky.; Madison, Wis.; *Memphis, Tenn.; *Milwaukee, *Minneapolis, *Moline, Ill.; *Montreal, Newark, N. J.; Newburgh, N. Y.; New Haven, *New York, *Oakland, Cal.; *Oklahoma City, Okla.; *Omaha, Neb.; *Philadelphia, Phoenix, Ariz.; *Pittsburgh, Pleasantville, N. Y.; Portland, Me.; *Portland, Ore.; Poughkeepsie, N. Y.; Providence, Reading, Pa.; Richmond, Va.; *Rochester, N. Y.; Rockford, Ill.; *Rock Island, Sacramento, Cal.; *San Francisco, *Seattle, South Bend, Ind.; Springfield, Mass.; *St. Louis, *St. Paul, Syracuse, N. Y.; *Toledo, *Toronto, Trenton, *Tulsa, Okla.; Utica, N. Y.; *Vancouver, B. C.; Williamsport, Pa.; Worcester, Mass.

*Stocks of Oakite materials are carried in these cities.

OAKITE

TRADE MARK REG. U.S. PAT. OFF.

Industrial Cleaning Materials and Methods

Tri-motor Transport Landing with B.B.T. Air Mail Type M-8-D Floodlight

You need

never be in doubt..

B.B.T.

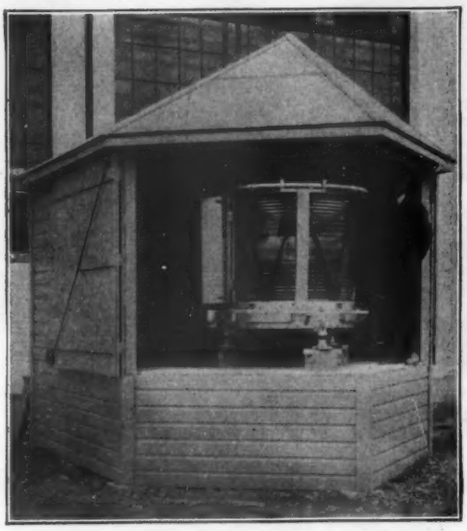
Floodlights

now available on a

Free TRIAL BASIS

will, if given the opportunity, conclusively prove their right to your preference.

At your own Airport—with the aid of your own pilots—under your own supervision—you can now conduct whatever tests you choose.



Typical Installation of B.B.T. Air Mail Type M-8-D Landing Floodlight

Flight Test these Floodlights under varying weather conditions. Try them on dark-rainy-foggy nights, when adequate illumination means so much to the Pilot. Test them for intensity, even distribution, area coverage, complete beam control (no stray upward light to blind the pilot) then learn of their

Low first Cost
Low Installation Cost
Economy of operation
Ease of control

We feel certain on the basis of such superior performance

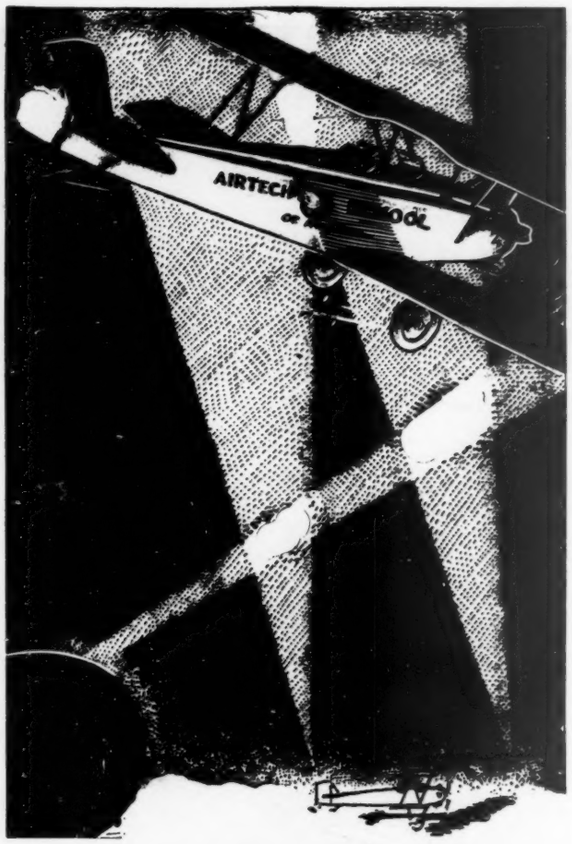
"AVIATION'S *bad weather* FLOODLIGHTS"

will be chosen for your airport.

Write for full details of this Free Trial Plan under which you incur no obligation whatsoever.

B·B·T
CORPORATION OF AMERICA
ATLANTIC BUILDING
PHILADELPHIA

MAKE YOUR AIRPORT SAFE FOR NIGHT AIR TRAFFIC—FLOODLIGHT WITH B. B.T.



You Will Fly At Night

while learning to be a Transport Pilot at Airtech School of Aviation. This advanced instruction is essential to your success as a commercial air transport pilot.

Mail the coupon today for detailed information about Airtech's complete Ground School and Flight Training facilities.

Department of Commerce Approved Transport Ground and Flying School

Clip Here — Clip Here

AIRTECH SCHOOL of AVIATION

Lindbergh Field San Diego California

Please send me, without obligation, complete information on the courses checked below:

- ☐ PRIVATE PILOT — 10 hrs. dual–10 hrs. solo flying, 30 hours Ground School
- ☐ LIMITED COMMERCIAL PILOT — 25 hrs. dual–25 hrs. solo flying, 60 hours Ground School
- ☐ TRANSPORT PILOT — 50 hrs. dual–150 hrs. solo flying, 140 hours Ground School
- ☐ ELEMENTARY MECHANIC — 240 hours Ground School
- ☐ ADVANCED MECHANIC — 480 hours Ground School
- ☐ MASTER MECHANIC — 720 hours Ground School

Name.....

Address.....

City..... **State**.....

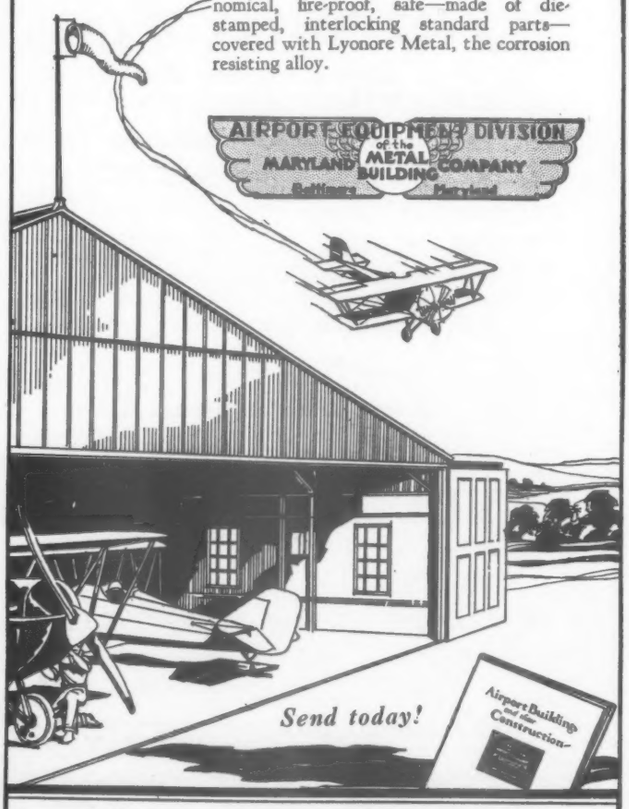
POWER From the blue

—to the staunch protection of a Maryland Metal Hangar

STAUNCH buildings, these—and ready on instant demand! Built to meet every requirement of the aviation industry—to allow maximum freedom in the handling of ships—to be quickly dismantled and re-erected without loss or confusion—to faithfully serve down through the years.

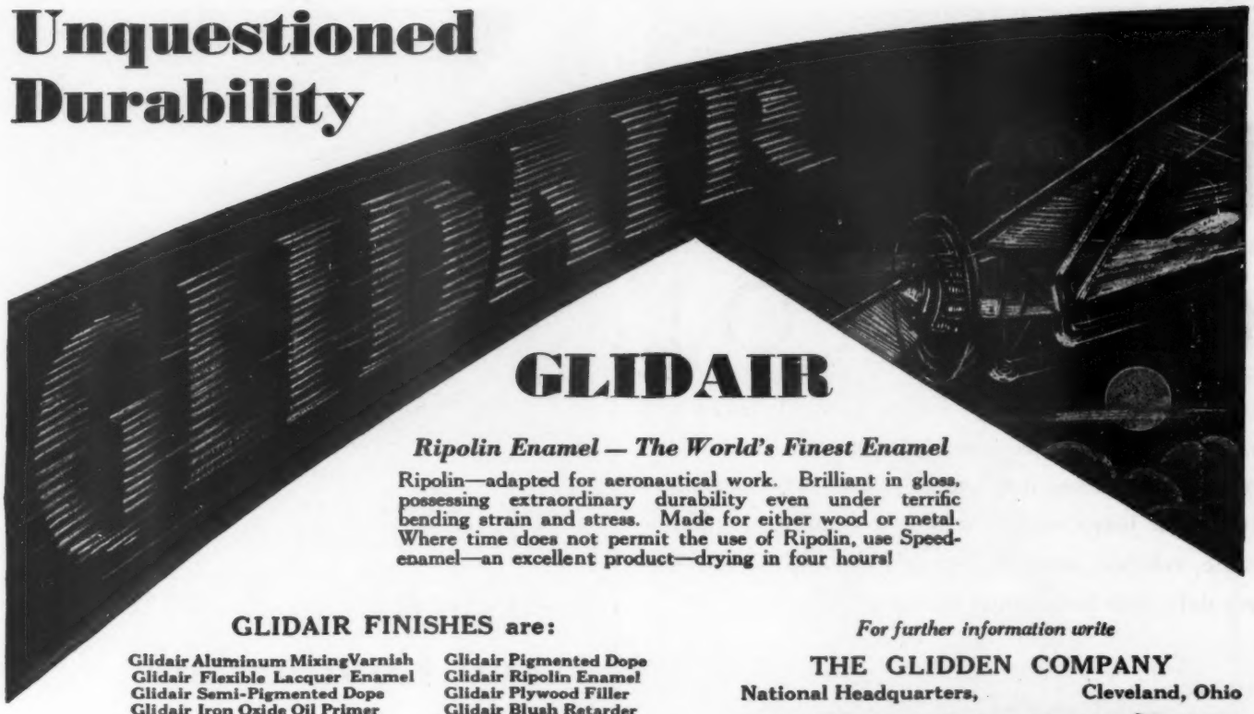
Hangars—shops—field buildings—any or all—up in a hurry—there to stay. Economical, fire-proof, safe—made of die-stamped, interlocking standard parts—covered with Lyonore Metal, the corrosion resisting alloy.

AIRPORT EQUIPMENT DIVISION of the MARYLAND METAL BUILDING COMPANY Baltimore Maryland



Estimate on any type or size of airport building furnished without obligation.

Unquestioned Durability



GLIDAIR

Ripolin Enamel — The World's Finest Enamel

Ripolin—adapted for aeronautical work. Brilliant in gloss, possessing extraordinary durability even under terrific bending strain and stress. Made for either wood or metal. Where time does not permit the use of Ripolin, use Speed-enamel—an excellent product—drying in four hours!

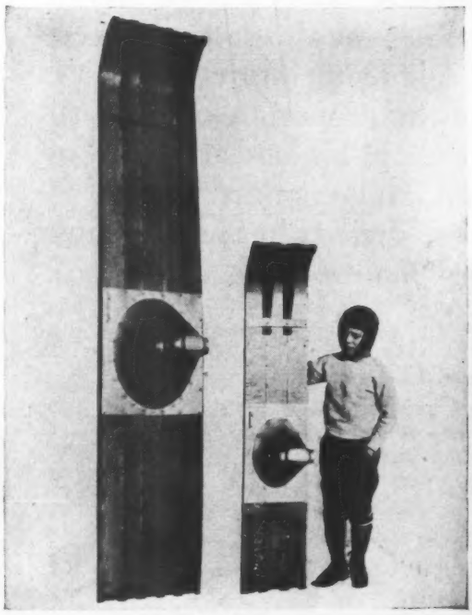
GLIDAIR FINISHES are:

Glidair Aluminum MixingVarnish
Glidair Flexible Lacquer Enamel
Glidair Semi-Pigmented Dope
Glidair Iron Oxide Oil Primer
Glidair Clear Gloss Top Coat
Glidair Clear Plywood Sealer
Glidair Clear Tube Coating
Glidair Clear Nitrate Dope
Glidair Clear Acetate Dope
Glidair Dope Proof White
Glidair Pigmented Dope
Glidair Ripolin Enamel
Glidair Plywood Filler
Glidair Blush Retarder
Glidair Brush Cleaner
Glidair Metal Primers
Glidair Speedenamel
Glidair Spar Varnish
Glidair Surfacers
Glidair Polish
Glidair Dope and Lacquer Reducer
Glidair Wood and Metal Preservative (Glidnoil)

For further information write

THE GLIDDEN COMPANY
National Headquarters, Cleveland, Ohio

GLIDDEN
EVERYWHERE ON EVERYTHING
PAINTS — VARNISHES — LACQUERS — ENAMELS



Large and Small Sizes of Federal Skis

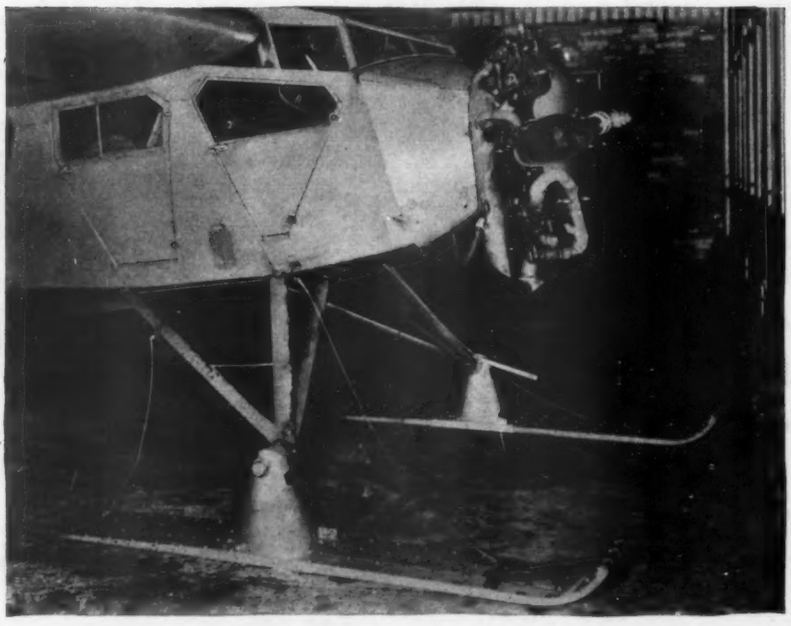
FEDERAL SKIS *approved*

To Replace Wheels on Regular Plane Gear

Federal has equipped more airplanes with skis than all other American manufacturers combined. The knowledge obtained from this experience has been built into Federal Skis. They have many desirable features obtainable in no other makes. The economy and necessity of ski equipment is proven by the large number of successful users. Federal Skis are standardized in a complete series of fourteen distinct sizes adapted to all classes of land planes up to 15,000 lbs., gross load. A light efficient aerodynamic installation, complete with tail ski and rigging, interchangeable with the wheels of the regular plane gear, can be purchased from the leading aircraft manufacturers and the larger distributing houses.
For prices and delivery date, write,

Federal Aircraft Works, Inc., 69 South Thirteenth St., Minneapolis, Minnesota

A Typical Federal Installation



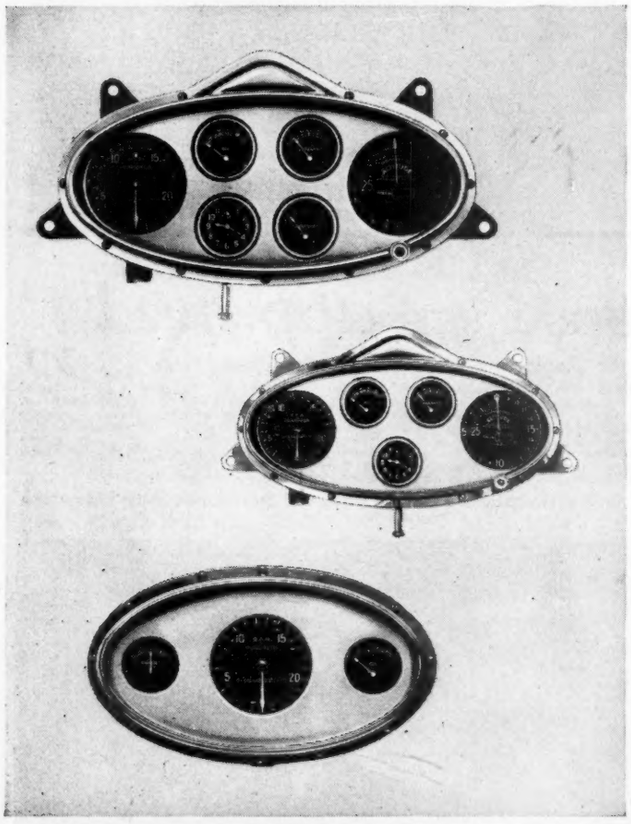
FEDERAL EQUIPPED

American Eagle
Bellanca
Buhl
Curtiss-Robin
Cardinal
Cessna
Eaglerock
Ford Tri-Motor
Fairchild
Great Lakes
Hamilton
Invincible
Lincoln
Monocoupe
Mohawk
New Standard
Ryan
Swallow
Stinson
Travel Air
Waco

AVIGO
ELGIN

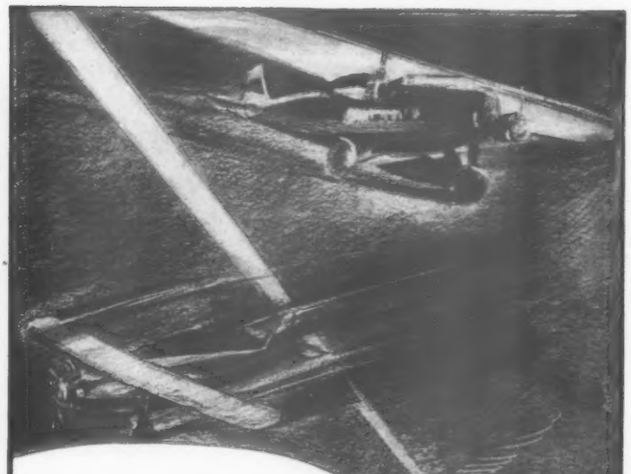
UNIT CONTROL

One glance at your ELGIN Unit Control Board and you know exactly how your power plant is functioning. No squinting into dark corners. No acrobatic twisting to learn what your engine is doing. It's handsome, reliable, accurate . . . and not expensive. Why not date your instrument board 1929?



AIRCRAFT INSTRUMENT DIVISION
ELGIN NATIONAL WATCH COMPANY

ELGIN AERONAUTICAL CHAMBER OF COMMERCE ILLINOIS



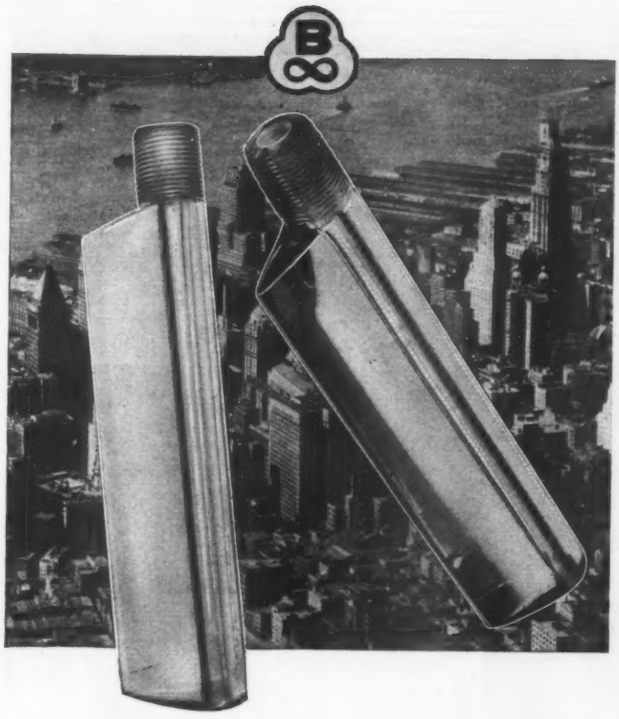
The Nation's Aces Keep Warm And Comfortable In The Coldest Flying Weather!

Watch those pilots who do record flying when the air snaps with frost and frigid temperatures beat back all but the properly clothed. All of these pilots are dressed in warmth and comfort. Most of them are dressed in Snappy Snug Flying Clothes.

Arthur C. Goebel
One of the pilots of national renown who enjoys warmth and comfort in SNAPPY SNUG FLYING TOGS.

SNAPPY-SNUG
FLYING CLOTHES

Canvas Leather Specialty Co.
Trenton, New Jersey



Amber Bakelite Resinoid
is superior for gasoline sight gauges

THE extraordinary service of the airplane places new demands upon equipment. Even the smaller parts, such as gasoline sight gauges, must possess more than the primary requisites of light weight and strength. Bakelite Resinoid is durable —with less weight and greater strength than glass— and now provides a superior sight gauge.

Unlike glass, Bakelite Resinoid may be threaded, eliminating the need for metal attachments. A hard blow may break or crack Bakelite Resinoid, but will not shatter it.

In service, the amber Bakelite Resinoid gauge has distinctive qualities. The pleasing amber color eliminates glare and eye-strain. The sight gauge of Bakelite Resinoid is unaffected by weather conditions and does not collect moisture deposit in temperature changes. Bakelite Resinoid affords pilot-protection in that it is non-inflammable, will not explode and does not shatter.

Manufacturers are invited to enlist the Cooperation of Bakelite Engineering Service

Write for Booklet 59R "Bakelite Resinoid"

BAKELITE CORPORATION
247 Park Avenue...New York, N. Y.
Chicago Office...635 W. 22nd Street
BAKELITE CORP. OF CANADA, LIMITED
163 Dufferin Street.....Toronto, Ontario

BAKELITE
THE MATERIAL OF A THOUSAND USES

If it's DEPENDABILITY *you want...*

...to keep your Production Lines on the move, Barnes-made Springs have been building a reputation for dependable service for years. Won't you tell us your spring requirements —one or a million?

★

The Wallace Barnes Co.
BRISTOL, CONN., U.S.A.

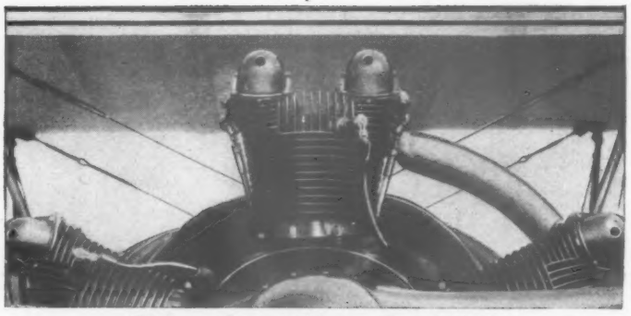
AIRPLANE SKIS

Frozen Lakes, Ponds, and Rivers allow you to fly where planes never operated before.

Carefully designed, well made and tested in four years actual use.

Write for Circular.

NEW HAMPSHIRE AVIATION *and* MARINE CO.
CONCORD, N. H. R. S. FOGG, MGR.



The Le Blond "60"

U. S. Dept. of Commerce
Certificate No. 12
Approved by the U. S. Navy
65 H. P. at.....1950 R. P. M.
Bore 4.125 in.....Stroke 3.750 in.
Piston displacement 250.58 cu. in.
Compression volume ratio...5.42:1
Dry weight complete.....222 lbs.
The LE BLOND AIRCRAFT ENGINE CORPORATION, *Cincinnati, U. S. A.*

JAEGER

Time of Flight Watch, 8 Day

ACCURATE time records in the air. Jaeger 8 day watches—or stop watch Chronograph—or an 8 day instrument with "time of flight" indicator. Standard with pilots in Europe and America. These models mount flush on the panel and have front wind and set. Radium treated dials if desired.

JAEGER WATCH COMPANY
304 EAST 45TH ST., NEW YORK CITY
London Geneva Paris

AERONAUTICAL TIMEPIECES

GAP FOOT SQUARING SHEARS

PEXTO

Pexto Gap Shears are offered in sizes 36-42-52 inches.

No. XC 52-52 inches with 18 inch Gap in housings is employed with success by the all-metal aircraft builder.

Write for catalogue No. 25 A, "Machines and Tools for Sheet Metal Work."

The Peck, Stow & Wilcox Co., Southington, Conn., U. S. A.

"AEROVEL"
MOHAIR FABRICS
The Shelton Looms

Mohair Fabrics

"for added attractiveness in aeroplane cabin interiors"

The Shelton Looms
AEROPLANE FABRICS DIVISION
ONE PARK AVENUE, NEW YORK

Midwestern Representative:
J. E. Menaugh Company
4618 Kenmore Avenue
Chicago, Illinois

A good fence

Western Air Depot, Los Angeles, Calif.

makes landing safer

Whirling propellers—taxi-ing planes—mean little to the curious public. They insist on pushing forward—closer—regardless of the possible danger to themselves—to pilot—to plane.

You can keep grounds free from "onlookers"—enforce "stay back"—avoid personal damage claims—prevent injury to personnel and equipment by installing a positive barrier of Page Chain Link Fence.

64 Service Plants erect fence everywhere. Fencing experts are at your service. Write for name and address of service plant in your vicinity—also for copy of new catalog just off the press. Page Fence Association, 520 No. Michigan Avenue, Dept. A24, Chicago, Ill.

INVESTIGATE! Page fabric available in Copperweld non-rusting wire—reduced upkeep—lifetime service.

America's first wire fence since 1883

PAGE

nation-wide service through 64 service plants

FENCE

CHAIN LINK · GALVANIZED OR COPPERWELD
ORNAMENTAL WROUGHT IRON

2nd ANNUAL
INTERNATIONAL NEW YORK AVIATION SHOW

America's Outstanding Aeronautical Exposition

ENTERTAINMENT
ACTION—THRILLS

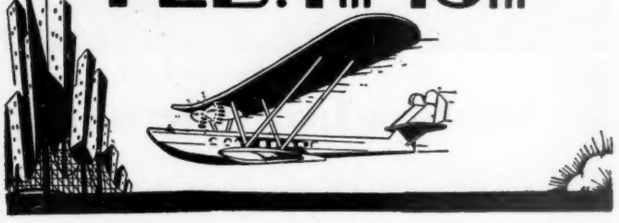
In the Heart of the World's Greatest Aeronautical Market

Auspices of
AVIATORS' POST 743
American Legion

Address all communications to:
NEW YORK AVIATION SHOW
152 West 42nd Street
New York City

GRAND CENTRAL PALACE

FEB. 7th TO 15th



HIGH GRADE
Gears — Cams — Precision Parts

INDIANAPOLIS TOOL & MFG. CO.
INDIANAPOLIS, INDIANA

Winter Weight Helmets

NAVY No. 2—Chocolate leather, beaverized wool lining. Extra heavy weight $6.00

NAVY No. 3—Imported cape, tan or acorn color. Chamois leather lined. Powder puff ear pads 6.00

NAVY No. 4—Imported chocolate cape, chamois leather lined. Powder puff ear pads 6.00

Nicholas-Beazley Airplane Company Inc.
Marshall -- Missouri

WESTERN BRANCH—3769 Moneta Ave., Los Angeles, Calif.

PITCAIRN AIRCRAFT

For Air Mail use , , , , SUPER MAILWING

For Sport or Private use , , SPORT MAILWING

PITCAIRN AIRCRAFT, Inc.

SEAMLESS
STEEL TUBING

All Aircraft Grades

WAREHOUSE STOCKS for immediate shipment in any quantity.

MILL SHIPMENTS for substantial production requirements.

SERVICE STEEL COMPANY

19 Scott St. BUFFALO
1435 Franklin St. DETROIT
32 E. Front St. CINCINNATI
216 N. Alameda St. LOS ANGELES

PACEMAKERS

Henry A. Berliner

Henry A. Berliner, Vice-President, former president of the Berliner Aircraft Company, a pioneer in aviation research since the early days of the industry. Temple N. Joyce, Vice-President, who gained an international reputation as a test pilot for the army during the war, brings to B/J the expert pilot's knowledge of what a plane must do.

Expect great things of B/J planes!

Temple N. Joyce

BERLINER-JOYCE
AIRCRAFT CORPORATION
BALTIMORE MARYLAND

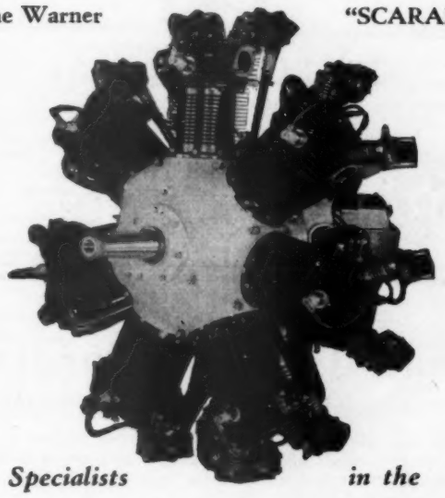
S.S.White Flexible Shafts *for* Tachometer Driving *and other* Power Transmission

Made by the largest producer of steel wire flexible shaft

The S.S.White Dental Mfg. Co.
Industrial Division
152 West 42nd St. New York, N.Y.

GOVRO-NELSON CO.

The Warner "SCARAB"



Specialists in the Machining of Crank Cases, Cylinder Barrels, Cylinder Heads, Pistons, Oil Pumps, and Small Allied Parts

1931 Antoinette Detroit, Mich.

PERFECT FLYING VISION

EXTRA WIDE CONTINUOUS HEAD BAND
GROUND CYLINDRICAL OR MENISCUS LENSES
NEW TYPE ADJUSTABLE BRIDGE MAINTAINING HORIZONTAL ALIGNMENT ESPECIALLY ADAPTED TO PRESCRIPTION LENSES
VENTILATION OUTLETS IN METAL FRAMES
NEW TYPE ASYMMETRICAL DOUBLE LIP SPONGE RUBBER CUSHIONS PREVENT ROLLING
(Patented)
LENS CLAMP
VENTILATION INLETS IN METAL FRAMES

$7.50 up

MEYROWITZ LUXOR GOGGLE
U.S. Air Service Model No.7

LUXOR GOGGLES by E. B. Meyrowitz

Send for catalog 520 Fifth Ave. New York

23

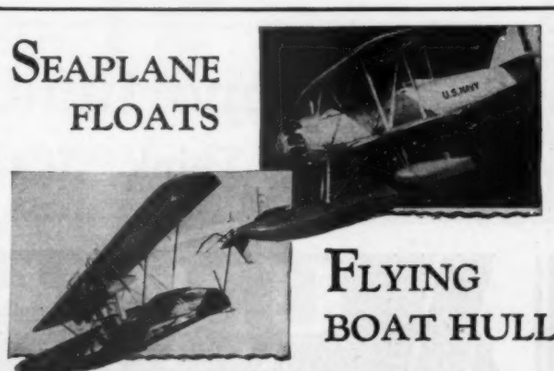
Makes of Planes Now Standard Equipped With

AEROL LANDING STRUTS

Every fourth issue of Aviation (as well as every issue of three leading monthlies) carries full page advertisements featuring individual planes in this group. Watch these advertisements.

THE CLEVELAND PNEUMATIC TOOL CO.
Cleveland, Ohio

SEAPLANE FLOATS



FLYING BOAT HULLS

SEYMOUR J. BAUM, Inc.
268-288 Albion Street Elmhurst, L. I.

TUBING by SUMMERILL

The Mark of Quality Aircraft

Summerill Tubing Co.
Bridgeport (Montg. Co.)
Penna. (Phila. District)

Cunningham-Hall Airplanes

All-metal structure — insures durability, lower maintenance and greater safety.

Manufactured by
CUNNINGHAM-HALL AIRCRAFT CORPORATION
13 Canal St.
ROCHESTER, NEW YORK

Heat Treated Forgings

Greatest strength with least weight

We are pioneers in the production of highest grade aircraft and automotive forgings, and we now have one of the most up-to-date heat-treating plants in the country.

Consult us on your requirements. We will gladly place our experience and resources at your disposal.

The Endicott Forging & Mfg. Co., Inc.
90 North Street, Endicott, N. Y.

ENDICOTT
"The forging people who satisfy"

U S SPECIAL AVIATION PISTON RINGS

Used by: Aeromarine, Alliance, Allison, American Cirrus, E. W. Bliss, Comet, Curtiss, Fairchild, Pratt & Whitney, Warner, Wright, and many others

See full page advertisement in current issues of Aero Digest, Western Flying and Aviation Engineering.

U. S. Hammered Piston Ring Co., Paterson, N. J.

SER-O-PLY

SERUM SEALED PLY-WOOD
BLOOD ALBUMEN GLUE — HOT PLATE PROCESS

AIR CRAFT PLYWOOD
manufactured with
BLOOD ALBUMEN WATER-PROOF GLUE
The Carrom Co.
Established 1889
LUDINGTON-MICHIGAN

SER-O-PLY is manufactured by an experienced organization with plants fully equipped with modern wood working machinery — 200,000 square feet of floor space.

Send us your specifications covering

- AIRCRAFT PLYWOOD
- PLYWOOD BOX BEAMS
- AIRCRAFT PLYWOOD FURNITURE
- CABINET WORK
- FABRICATED AIRCRAFT WOOD PARTS
- WING RIBS

COLONIAL GRAIN UPHOLSTERY LEATHER

made by
EAGLE-OTTAWA LEATHER COMPANY
Grand Haven, Mich.

Genuine leather for airplanes is NON-INFLAMMABLE durable and clean.

Sample books furnished on application

Chicago, Ill. 912 W. Washington Blvd.
New York City 74 Gold St.
St. Louis, Mo. 1600 Locust St.
San Francisco, Calif. 569 Howard St.
Toronto, Ont. 152 Duchess St.
Portland, Ore. 474 Glison St.

"Opportunity" Advertising:

Think "*SEARCHLIGHT*" First!

UNIVERSAL

ALL AERONAUTICAL SUPPLIES
AVIATION CORPORATION
ROBERTSON DIVISION
LAMBERT-ST. LOUIS AIRPORT, ANGLUM, MISSOURI

WHERE TO FLY

ALABAMA

Our Sunshine and Warm Weather Makes Student Training Pleasant.

MONTGOMERY SCHOOL OF AERONAUTICS
Montgomery, Alabama
Illustrated catalogue on request.

FLORIDA

The Insignia MAC *of Leaders*

The ease with which our students pass the U. S. Department of Commerce examinations proves that we employ the
PROPER METHODS
CORRECT EQUIPMENT
RIGHT TYPE of PILOT as instructors

IDEAL { Airport / Living Accommodations / Weather—all year

Combine pleasure with profit by completing your aviation training this winter in the South.
Wire, write or call for details

McMullen Aviation College
Tampa, Florida, 110 West Shore Blvd.

NEPCO—School of Flying

Announces the opening of their Winter Flying School at Piper Fuller Airport, St. Petersburg, Florida, December 1st.
Entire flying equipment and personnel will be moved from its own mile square airport, Wisconsin Rapids, Wis., to the Sunshine City. Planes used for instruction include Fairchild-KR. Biplanes, Curtiss Robin Monoplanes, Fairchild 5-passenger Monoplanes and 12 passenger Ford Tri-Motor Monoplanes. Room and Board at airport. Enrollments being received now and limited to 50 students.
25 Hr. Private Pilot's Course, $475. 50 Hr. Limited Commercial Pilot's Course, $850. 200 Hr. Transport Pilot's Course, $3,500. Terms can be arranged. All planes and Pilots Licensed by U. S. Government. For full information write, wire or call.
NEPCO TRI-CITY Flying Service, Inc.
Capt. L. G. Mulzer, Gen. Mgr.
St. Petersburg, Fla.

ILLINOIS

MEMBERS FLY FREE!

CHHC

Write us for particulars.
COSMOPOLITAN HEALTH and HAPPINESS CLUB
Suite 1926, 111 W. Washington, Chicago

Eagle Airways, Hinckley, Illinois, formerly Eagle Airport School of Aviation, 60 miles West of Chicago. Learn to fly at our new location on the Transcontinental Airway, DeKalb County Airport, equipped for night flying. Transport Pilots, modern equipment, reasonable rates, excellent accomodations. Distributors for Stinson Monoplanes, Air-Kings and Monocoupes. Write for free information.
EAGLE AIRWAYS, INC.
Hinckley, Illinois

KANSAS

LEARN TO FLY IN WICHITA

The logical place to learn aviation is where the industry is centered—Wichita, the Air Capital, where 25% of the commercial planes flying in America today were made, where opportunities are waiting while you prepare. May we tell you about it? Write today.
THE BRALEY SCHOOL OF FLYING
Department 8, Wichita, Kansas.

MARYLAND

Learn to fly this winter and be a licensed Pilot by next Spring. We instruct all winter at reasonable rates: $20.00 per hour for dual and $15.00 per hour for solo time. Fly over safe, flat country in open and closed planes. Instruction in TP Swallows, and cabin time in a Robin, at the above rates. Also, good bargains in used planes of the Curtiss line. Write for particulars.
Tred Avon Flying Service, Inc., Easton, Maryland.

MICHIGAN

SKYWAYS ARE EASY HIGHWAYS—OUR WAY!
Flying, Business and Mechanical Courses thoroughly taught by the
BATTLE CREEK FLYING SCHOOL, INC.,
Battle Creek, Michigan
Personnel and Equipment in accordance with Department of Commerce Regulations. Write for particulars on our payment plan.

MISSOURI

UNIVERSAL AVIATION SCHOOLS N-693

A National System of Government Approved Aviation Schools

Universal Flying School	Cleveland, Ohio
Universal Flying School	Memphis, Tenn.
Universal Flying School	Minneapolis, Minn.
Universal Flying School	St. Louis, Mo.
Universal Flying School	St. Paul, Minn.
Universal Flying School	Kansas City, Kansas

UNIVERSAL AVIATION SCHOOLS
Headquarters
1061-1070 Boatmen's Bank Bldg., St. Louis, Mo.

NEW JERSEY

GET A FLYING START AT
AIRVIEW FLYING SERVICE, Inc.

Learn to fly at finest Airport on Jersey Coast

Distributors for	*Agents for*
Waco	Fairchild
Aeromarine-Klemm	Curtiss Products

Taxi Service — Photography — Service and Repairs — Hangar Space — 1 hour from New York City.
Write for details.
Phone Red Bank 1730
Red Bank, N. J.

NEW YORK CITY

CURTISS-WRIGHT FLYING SCHOOLS
For a thorough aviation education select one of Curtiss-Wright's 40 standard schools. Write for booklet. Dept. P, 27 West 57th St., New York City.
Curtiss-Wright Flying Service
"World's Oldest Flying Organization"

NEW YORK STATE

THE PERFECT TAKE-OFF FOR YOUR FLYING CAREER...

ROOSEVELT AVIATION SCHOOL

After the Army pattern—equipment, curriculum, Army-trained instructors. At Roosevelt Field, where Lindbergh, Chamberlin and Byrd hopped from. 45 minutes from Broadway. Dormitory, for resident students, and swimming pool now in progress. *Write* N. J. Boots, Lt. Col., Roosevelt Aviation School, Inc., Mineola, L. I., N. Y.

OHIO

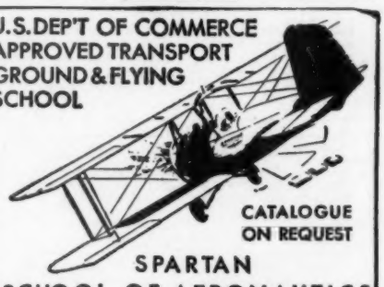
COME TO FINDLAY—Safest Flying Area in U. S.

Dual $20.00 Pr. Hr. — RAS — WACO — WACO — Solo $15.00 Pr. Hr.

Special Prices on Full Courses.
RUMMELL AVIATION SCHOOL, LTD.
Findlay, Ohio

OKLAHOMA

U.S. DEP'T OF COMMERCE APPROVED TRANSPORT GROUND & FLYING SCHOOL



CATALOGUE ON REQUEST

SPARTAN SCHOOL OF AERONAUTICS
TULSA OKLA.

PENNSYLVANIA

STULTZ FIELD
TIPTON, PA.

Four Way Field
80 Acres
Complete primary and advanced ground and flying courses.
All equipment and personnel licensed by both State and Federal Departments of Commerce. Write for booklet.

Altoona Aircraft Corp.
P. O., Tyrone, Pa.
Central, Pa. distributors for Curtiss Flying Service, Kreider-Reisner Aircraft Corp.

PITCAIRN AVIATION of Pennsylvania, Inc.

10-, 20- and 50-Hour Flying Courses leading to Federal licenses conducted at Pitcairn Field, Willow Grove, Pa., one of the largest in the East, in midst of ideal flying country. All-year-round school. Modern flying equipment. No liability bond required. Write for Illustrated Booklet.

Pitcairn Field, Willow Grove, Pa.

The fact that schools advertising in the WHERE TO FLY section of AVIATION have done so over a period of years is one of the best testimonials to the efficiency of this type of advertising.

Aircraft Service Directory

See our Advertisement
On inside back cover of Dec. 14th issue.
PIONEER INSTRUMENT COMPANY
254 LEXINGTON AVE. BROOKLYN NEW YORK

HASKELITE
PLYWOOD
Used by every important builder. Recognized as the standard plywood for airplane construction. Over 30 applications. Blue print data book on request.
HASKELITE MFG. CORPORATION
120 S. LaSalle Street, Chicago, Illinois

Piston Pins for Aircraft
Burgess Norton Perfectlap Piston Pins for the following makes of motors are stocked by Automotive Jobbers everywhere.
Curtiss OX-5
Curtiss OXX-6 — U.S.A.Std.
Wright — J4, J5 — Liberty
Whirlwind — J4, J5
THE BURGESS NORTON MFG. CO.,
549 Peyton St., Geneva, Ill.

TRIUMPH
MAGNETIC
FUEL GAGES FOR AIRCRAFT
NEW MODELS FOR COWL, WING, OR SPECIAL TANKS
Manufactured by
The Boston Auto Gage Company
PITTSFIELD, MASSACHUSETTS

Patent Your Ideas
Send me a sketch or simple model of your invention. SATISFACTORY TERMS.
Free Confidential advice Illustrated Literature
Z. H. Polachek, 1234 B'way, N. Y.
Z. H. POLACHEK 1234 BROADWAY PATENTS NEW YORK REG. PATENT ATTORNEY

DANIEL GUGGENHEIM SCHOOL OF AERONAUTICS
Graduate and Undergraduate Courses in Aeronautical Engineering and Air Transport. Particulars from Dean, College of Engineering.
NEW YORK UNIVERSITY
University Heights, New York, N. Y.

Northeaster
FLYING TOGS
HELMETS · GOGGLES
FLYING SUITS
WRITE FOR COMPLETE CATALOG
BECK DISTRIBUTING CORP. 80 E. 11th St. N.Y.C.

MOTORIZE YOUR HANGAR DOORS
Allen & Drew, Inc.
Cambridge, Mass.

PITCH & BANK INDICATOR
Your Position at a glance
Booklet "RIEKER Navigating Instruments" sent on request.
RIEKER INSTRUMENT COMPANY
1919 Fairmount Ave., Philadelphia, Pa.

ALL-AMERICAN GLIDER KIT
COMPLETE WITH RIBS
Price $50 F.o.b. Dearborn
EVERYTHING BUT DOPE, NAILS AND SCREWS
ALL-AMERICAN GLIDER CO.
DEARBORN, MICH.
Send 10 cents for first issue of American Glider News

Airplanes & Engines
Overhauled—
Repaired—
Rebuilt—
All work in accordance with Dept. of Commerce regulations.
'Phone us for estimate
Westchester Airport Corp.
Field Office—Armonk Village (N. Y.) 308
New York Office—Caledonia 6188

STEARMAN and AEROMARINE KLEMM
GEO. A. WIES, INC.
Hangar and Office, Roosevelt Field — Garden City, New York

PITCH INDICATOR
Adjustable Zero
Readable at a Glance.
Booklet on Request
Frisbie Aircraft Products
Box 389, New Haven, Conn

REG U.S. PAT. OFF.
STAKLAK WONT BURN OFF
Developed especially for use on airplane exhaust rings, manifolds and stacks.
Adds greatly to the appearance of any ship. Protects the surface from scale and rust.
Can be furnished in three colors, Red, Blue or Green half-pint cans 50c or Aluminum half-pint cans 75c.
Manufactured exclusively for and sold by
JOHN S. COX & SON
Aeronautical Supplies
Terre Haute, Ind.

Send for Catalog
32 STYLES
AVIATION
GOGGLES
Strauss & Buegeleisen

Professional Services

If You Need Expert Advice on Engineering Problems
Write or Wire
AIRCRAFT ENGINEERS INC.
Consultants for the Aircraft Industry
2012 So. Wabash Ave., Chicago, Ill.
Complete Stress Analysis
Development of New Designs

C. L. OFENSTEIN
Consulting Aeronautical Engineer
Formerly
Chief, Engineering Section
Aeronautics Branch, Department of Commerce.
AIRPLANE DESIGN & STRESS ANALYSIS
Tower Building, Washington, D. C.

PATENTS—TRADE MARKS
Don't Lose Your Rights To Patent Protection
Before disclosing your invention to anyone send for free blank form "EVIDENCE OF CONCEPTION" to be signed and witnessed.
LANCASTER & ALLWINE
Registered Attys.
421 Ouray Bldg., Washington, D. C.
Originators of forms "Evidence of Conception"

GAZLEY AND LASHA
Consulting Aeronautical Engineers
Hill Building, 17th and I Sts. N. W.
Washington, D. C.
Stress Analysis — Airplane Design

Edward A. Stalker, 302 Eng. Bldg.
AIRPLANE DESIGN
Stress Analysis
Performance Tests
Aerodynamic Investigations
Ann Arbor, Michigan

If

you cannot find the kind of professional service you need in this directory, write at once to the **Professional Directory Division, Tenth Ave. at 36th St., New York City.** You will be put in prompt touch with reliable individuals or firms offering the services required.

SEARCHLIGHT SECTION

EMPLOYMENT and BUSINESS OPPORTUNITIES—USED and SURPLUS NEW EQUIPMENT

UNDISPLAYED—RATE PER WORD:

Positions Wanted, Positions Vacant, and all other classifications, excepting equipment, 10 cents a word, minimum $2.50 an insertion; 15 cents a word if a box number address care of any of our offices is used.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers may be in care of our New York, Chicago or San Francisco offices.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 3 inches.....$6.00 an inch
4 to 7 inches..... 5.75 an inch
8 to 14 inches..... 5.50 an inch

Other spaces and contract rates on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

Over 20,000 other men in the rapidly growing Aviation Industry see this page!

Advertise here for quick and profitable results.

SEARCHLIGHT DEPT.

Aviation

Tenth Ave. at 36th St., N. Y. C.

New "SEARCHLIGHT" Advertisements

must be received by 10 A.M. Monday to appear in the issue out Saturday.

Address copy to the Searchlight Department

Aviation

Tenth Ave. at 36th St., New York City

FOR SALE

CURTISS Robin for sale with Millerized OX-5 motor, has had 170 hours. Ship has had 160 hours. Both in excellent condition. Price, $2,500. FS-362, Aviation, 520 No. Michigan Ave., Chicago, Ill.

D. H. Gypsy Moth (steel), N.C.-810-E. 170 hours. Complete factory overhaul. Privately owned. Best of care. $3,500. H. L. Pruyn, Glen Cove, N. Y.

FOR SALE: New Gypsy engine, 95 hp., also Rover inverted engine, 60 hp. Both engines new and in crates. Will accept best offer. W. K. Jay, c/o Northrop Aircraft Corporation, United Airport, Burbank, Calif.

Detroit Aero Motors Co.
5055-59 Townsend Ave., Detroit, Mich.

MOTORS FOR SALE:

1—J-6 Wright Whirlwind.
3—J-5 Wright Whirlwinds.
1—Warner Scarab Motor.
1—Sixty LeBlond.
1—Sixty Velie.
1—Model E Hispano.
1—Model A Hispano.
1—OXX-6 Curtiss.
5—OX-5 Curtiss.
1—110 hp. Anzani.
1—45 hp. Anzani.

Write for information and prices.

Two OX Command-Aires

1—90 hours, just like New.....$2700
1—Brand New in storage..... 3100

Ships are Licensed have Navigation Lights, Compass, etc. Also OX5, 15 hours. Perfect, $450

A. R. TAYLOR,
214 Junction Ave., Detroit, Mich.

J-5 WACO 10

Straight-wing, like Ford Tour Winner. All instruments. Wingtanks. Flown 50 hours. Black fuselage, yellow wings. Never injured. Owner buying cabin ship. Reasonable terms.

W. B. HARDING
No. 14 Sutton Pl. S., New York City

FOR SALE
MONOCOUPE

Velie M-5 motor, 81 hours time. Genuine Spanish grain leather upholstering. Wide landing gear, navigation lights, and wired for landing lights. Recently repainted and can't be told from new. Price $1,500.00. Cash only.

BENJAMIN F. BITLER
Box 28, Olpe, Kansas.

FOR SALE

FOR SALE: My Whirlwind Waco, new September 14, 1929, fully equipped for night flying. Special nickel chromed struts and exhaust stacks. Standard steel propeller. New Trypod type undercarriage with Bendix heel brakes. This ship must be seen to be appreciated and is priced to sell. E. A. Forner, Jackson, Mich.

FOR SALE: OX-5, OXX-6 and Hisso engines. Write for complete description. Heckman Machine Works, 4026 Lake Street, Chicago, Illinois.

SALMSON 9 cylinder, 230 hp. Radial engines, model Z-9. New engines, advertised last month, have been disposed of, but have a few left which have been slightly used. From fifty to one hundred fifty hours, but guaranteed to be serviceable. Splendid for instruction or experimental purposes. $250 each, complete. Also a few without magnetos, otherwise complete. $200. Complete stock of parts carried for this engine. Menasco Motors, Inc., 6718 McKinley Ave., Los Angeles, Calif.

FOR SALE—J-5 Stearman Biplane; condition of ship and motor perfect. Will give any demonstration or inspection. $4,500 cash. FS-382, Aviation, Tenth Ave. at 36th Street, New York.

FOR SALE: Curtiss Robin with Millerized OX-5 Scintilla magneto. Motor has had 100 hours. Ship new. Located at St. Louis, Mo. Price, $3,300. FS-361, Aviation, 520 No. Michigan Ave., Chicago, Ill.

FOR SALE
LOENING AMPHIBIAN
as is
$6,000.00
New, March, 1929

Complete with Wright Cyclone, 525 H.P. Engine

Change of policy forces us to sacrifice damaged Leoning. Motor now at Wright factory for installation of latest Cyclone improvements.

Total time on engine less than 150 hours. Will be equal to new engine when alterations are complete.

Ship was licensed for six passengers and crew of two.

If interested, write or wire for complete particulars.

Westchester Airport Corp.
122 East 42nd St. Caledonia 6188
Armonk, N. Y. Armonk Village 309

All the Up-to-Date Facts of Aviation— for Quick Reference—

1929 — a year of bewildering progress! Nearly 200% increase in licensed flyers. Domestic air mail doubled. Scheduled operations increased from 27,000 to 100,000 miles daily. 166 approved type certificates for aircraft, 19 for engines, 28 for propellers. 90,000,000 people in territory served by air lines for freight, mail, and passengers. And 1930 promises to break all records again. Are you accurately posted on all the important developments in the field? You can have all the facts at your finger tips in

The Official Review of Aviation Progress

AIRCRAFT YEAR BOOK for 1930

Prepared by the Aeronautical Chamber of Commerce of America, Inc. in cooperation with officials of the Government Service.

For 11 years the one indispensable reference tool for every man engaged in the science and business of aeronautics. And now, the 12th annual edition contains more valuable data than ever before, reflecting the tremendous advances of aviation in the past year. A vivid panorama of the entire world of flying which every technician, flying man, air line official, and manufacturer should have.

139 Pages of Aircraft and Engine Designs

The progress of American manufacturers and engineers are recorded in a 139 page section of immensely interesting and valuable designs. There are chapters on recent governmental activities; flights and experiments with dirigibles; air races; new planes, engines, accessories, and equipment.

And an elaborate appendix containing hundreds of important facts and statistics.

Fully indexed!

The *Business* of Aviation

Rapid expansion — capital — statistics of operations—manufacturing progress — airports and flying fields—training schools—mail, freight, and passenger lines—tables of flying schedules, etc.—and a wealth of additional material of constant reference value.

200 Illustrations and Airway Maps

Over 200 photographs, as well as airway maps of the United States, South America, and Europe. And to make the volume absolutely complete — a day-by-day chronology of aeronautical events in 1929! Durably bound to withstand constant handling. Price $6.00. Send for your copy promptly!

MAIL THIS COUPON FOR A FREE TRIAL

D. Van Nostrand Co.,
250 Fourth Ave., New York

Please send me a copy of the Aircraft Year Book for 1930. At the end of 10 days, I will either remit $6.00 in full payment, or return the book and owe you nothing.
(Aviation 1-30)

Name .....

Address .....

City ..... State.....

FOR SALE

FOR SALE—Curtis Challenger motor, four-place cabin monoplane, has Curtis-Reed metal propeller, Grüss shock absorbers with Bendex wheels and brakes, Inertia starter, turn-bank air speed indicator; together with blue prints, engineering data, weight, balance and stress analysis. Motor has twenty hours flying time and ship ready to fly away. This is an excellent opportunity for manufacturer interested in this type of ship. Can be had at exceptionally low price. FS-391, Aviation, 520 No. Michigan Ave., Chicago, Ill.

FOR SALE—Eastman K5 camera, 20 in. lens, perfect shape, complete with view finder, venturi, oblique and mapping mounts. Bargain, $700. M. A. C. Johnson, Augusta, Georgia.

FOR SALE—Henderson 4-cylinder motor, suitable for airplane, seasled, wind-wagon, etc. Just overhauled, complete with propeller and hub. Price $150. 4817 George Street, Chicago, Ill.

FOR SALE or trade. Cafe doing $10,000 a year business, modern fixtures, no competition, rent $17, real moneymaker; $2,000 cash, or trade for Travelair, Waco, Monocoupe or Eaglerock of equal value. What have you? Paul E. Ryman, Agenda, Kansas.

FOR SALE—Waco 10, excellent condition, 155 hours total time since new, always kept in hangar, privately owned and used. N. C. license renewed December 31, 1929. $1,500. F. J. Schenk, Keokuk, Iowa.

FOR SALE—3-place cabin monoplane (powered with 80 hp. Anzani). Two propellers, Curtiss-Reed metal and Hamilton wood, motor has had 50 hours. Ship needs slight repairs (not crashed). $450 cash takes all. Beach's Auto Electrical Service, 79 East Blackwell Street, Dover, N. J.

FOR SALE, Hisso, model-A-150 hp., new main and connecting rod bearings fitted perfect, valves ground, good mags., motor complete and in top-top shape, this is a real bargain at $320. Hisso-220 hp., less carb. and mags., $45. OX-5, 54 hours, complete and in excellent condition, $300. Lots of other motor parts, cheap. All material crated F.O.B. Wire or write, Clayton Lemon, 1303 Third Ave., Roanoke, Va.

FOR SALE—Two cylinder Lawrence, with prop., good as new, $75. Four cylinder Henderson, complete. Crankcase faced up, $45. Third with order, balance after inspection. Wanted, SE5A without motor. Conditions of wings unimportant. L. M. Shultis, Kelly's Corners, N. Y.

$1,500, OX-5, Eaglerock long wing, good shape, never been in crash, licensed, new mag., Miller overhead. Will deliver anywhere in Florida for expenses. Bill Seward, Arcadia, Fla.

ONE new Cessna A. W. Warner cabin monoplane, has been used thirty hours. Owner must sell on account of not obtaining pilot's license. Price $5,000. Can be seen at Palwaukee Airport, Mount Prospect, Ill. Address L. Bjourndahl, in care of Palwaukee Airport.

ONE set of (2 wings) Heath super parasol, Clark Y, brand new, complete, unused, uncovered, and in perfect condition for $150. Sea Horse 10, $85. 327 Pearl Street, Rocky Mount, N. C.

OX-5 now turning 1,380, $350. Also Berling magneto, OX-5 crankshaft and miscellaneous parts, cheap. Carlton J. Hinman, Cooperstown, N. Y.

KEYSTONE LOENING
Air Yacht

Equipped with Cyclone 525 h.p. engine. Used only 20 hrs. Perfect condition. Very attractively priced for quick sale. Wire for particulars.

ROBERTSON AIRPLANE SERVICE CO.
St. Louis Municipal Airport, Robertson, Mo.

FOR SALE

One Damaged Curtiss Challenger Engine and One Velie M-5, Nearly New, Less Magnetos

At very reasonable prices.
P.O. Box 4111, Tampa, Fla.

There is a

Searchlight Section

in each McGraw-Hill paper:

American Machinist
(American Edition)

Aviation

Bus Transportation

Chemical and Metallurgical Engineering

Coal Age

Construction Methods

Electric Railway Journal

Electrical Merchandising

Electrical World

Engineering News-Record

Engineering and Mining Journal

Food Industries

Power

Radio Retailing

Textile World

And also in the McGraw-Shaw papers:

Factory and Industrial Management

Industrial Engineering

For advertising rates and other information on any or all of these publications, address

SEARCHLIGHT DEPT.
Tenth Ave. at 36th St., New York

FOR SALE

PARACHUTES, new and used, rope ladders for stunt men, etc. Specify weight. Thompson Bros. Balloon and Parachute Co., Aurora, Illinois. Established 1903.

WACO 10, OX-5, special paint job, licensed. New condition, bargain at $1,725. Paul E. Miller, Gettysburg, Ohio. Box 18.

TWO Liberty engines, one has had one overhaul the other two. Will sell for cash. First offer $500 takes each. R. J. Waymel, 2700 Argyle Ave., Chicago, Ill.

WACO 10, OX-5, licensed. Flown 500 hours, motor just overhauled, ship never cracked up, equipped with Aerol Struts and compass. Has been used as dual instruction ship. First $1,200 takes it. Dungan Airways, Inc., Cleveland Airport, Cleveland, Ohio.

EQUIPMENT WANTED

Wanted Used Planes

We will sell your plane for cash on commission basis. No storage or demonstrating expense. Have large number of prospects for good used ships that are priced right. For full details, write Georgia Flying Service, Miller Airport, Macon, Ga.

AIRPLANE wanted, trade Packard 6—1925 coupe, $500 cash, $100 month, for Waco OX or Hisso, job less motor, consider other ships. Can need repairs. Details first letter. EW-389, Aviation, 520 No. Michigan Ave., Chicago, Ill

BUY or trade. Two lower wings, undercarriage and prop. required to repair Travelair OX-5, model 2000. Will either buy this equipment, sell any part we have, trade plane for a similar plane without motor or let whole outfit apply towards a higher powered job. Malone Aero Club, Malone, N. Y.

WANTED, pair lower wings for OX-5 Travelair; also OX prop. Dawson-Babcock Aircraft Corp., 1001 Law and Finance Building, Pittsburgh, Pa.

TRADE

TO TRADE—1928 Auburn eight sedan in perfect condition, for a licensed three place open plane. Will pay cash difference. Harry F. Deuter, 933 Pemberton Drive, Fort Wayne, Indiana.

POSITIONS VACANT

ENGINEERS and draftsmen. Leading aircraft manufacturer can use services of practical, experienced engineers and draftsmen. P-357, Aviation, 520 No. Michigan Ave., Chicago, Illinois.

POSITIONS WANTED

COMPETENT young engineer with best of training and diverse experience desires position with sound progressive concern. Will consider foreign contract at suitable salary. PW-387, Aviation, 520 No. Michigan Ave., Chicago, Ill.

L.C. pilot, age 27, unmarried, Curtiss trained, good references; 2 years college. Work for living expenses for reliable concern or individual for chance to get in flying time. PW-388, Aviation, Tenth Ave. at 36th St., New York.

Circular Matter Cannot Be Forwarded

Replies to box number advertisements in the Searchlight Section are not called for at our offices, but must be remailed in new envelopes and under new postage at our expense.

Under the circumstances, we reserve the right to examine, question, and withhold any replies not offering the results sought in the advertisements.

Advertisers Want

Bona-fide Returns

6-15

POSITIONS WANTED

POSITION wanted—as operation's manager, sales representative or test pilot. Ex-army instructor, twelve years' experience, 5,400 hours, all type planes. Best of references. Services available after January 1st with large, established company only. M. A. C. Johnson, Augusta, Georgia.

LIMITED commercial pilot, Parks Air College graduate, desires position as pilot. Henry Huber, 3444 William Place, St. Louis, Mo.

TWO pilots—one 11 years' experience, qualified instructor—seek sales position with well financed airplane manufacturer. Thirty-three years old. At present sales executive of one of Midwest's leading financial institutions. Address W. G. Meier, 110 Coolidge Ave., Barrington, Illinois.

WORK WANTED

WANTED: Repairing, rebuilding and overhauling any type airplane. All work by licensed mechanics. Let us estimate on your job. Rummell Air Service Ltd., Findlay, Ohio.

SALESMEN WANTED

Wanted Licensed Pilots, With Own Plane

As salesmen to cover airports and municipalities for manufacturer of gaseous tube Beacons and other lighting equipment. Protected territory and liberal commissions will be alloted to men who can furnish satisfactory references. Give flying experiences and connections in territory you want. Aeronautical Dept., Luminous Products, Inc., 641-43 No. Broad Street, Philadelphia, Pa.

BUSINESS OPPORTUNITIES

WELL established manufacturing company interested in securing new devices for aviation industry. BO-367, Aviation, 520 North Michigan Ave., Chicago, Ill.

MISCELLANEOUS

FUR lined flying suits, slightly used Navy surplus $20 each; heavy leather helmets $1.50, money back if not satisfied. Block tested Hisso A ready to mount in ship $450, with used prop. Liberty, 12-volt H.G. $300 up. Liberty parts of all kind. New A.C. plugs $20. Will trade Licensed Seagull C-6 motor, feed prop. ready to fly for licensed tractor seaplane, or sell $3,000. OXX Dixie mags. $15 each, new 20 ft. of aircraft wire with turnbuckle, new, 50c. Dual stick control for light ship, complete $25. Frank Mills, Essington, Pa.

Engineering Executive

Graduate Aeronautical Engineer, 5 years experience on all metal design, 2 years executive engineering experience, designer of one of America's best known all metal transports wishes to make connection with established manufacturer in executive capacity. A1 references from last employers. Services available Feb. 1st.

P.O. Box 63, Sta. C, Cincinnati, Ohio

NOW AVAILABLE

Navy Trained Transport Pilot

Age 32, single, steady, airplane and engine mechanic's license; experienced on open and closed land and seaplanes, instruction cross country testing; 3 years' war experience. Desires position with company or private owner.

PW-390, Aviation
10th Ave. at 36th St., New York City

ATTENTION

Men wishing to work on airport as apprentices to mechanics license write today for list of Airmail lines and Airports where apprenticeship connections may be made. Send one dollar for service fee.

AVIATION APPRENTICE SERVICE
A-136 Second Street, Milwaukee, Wis.

If you are really interested in Aviation—will you accept a free membership to the AVIATION SERVICE LEAGUE? We want 100,000 members to promote aviation. If you are over 18 years of age send for free membership. Positively no obligation.

AVIATION SERVICE LEAGUE,
823-A 56th Street Milwaukee, Wisconsin

Here It Is! Brand New!

The One Great Guidebook Needed By Every Man in Aviation

THE AVIATION MANUAL

A Complete Ground Course for Beginners

A Quick Reference Handbook of Authoritative Data for the Flyer and Technical Man

Now, for the first time, the whole subject of aviation is covered thoroughly in one profusely illustrated handbook—an encyclopaedia of flying—a complete exposition of planes, their construction, equipment, and operation. It offers the practical knowledge needed by the man who wants to fly and the man concerned in any way with the science or business of aeronautics. It explains theory and practice in clear, everyday language, aided by a wealth of photographs, diagrams, and tables.

Edited by
Lt.-Commander John W. Iseman, U. S. N. R.

who has more than 5000 flying hours to his credit and twelve years' instruction experience. Many of his former students are now holding responsible positions as pilots and executives. He was assisted in the preparation of this book by Col. Boots of Roosevelt Field, Assen Jordanoff, and many of the most eminent pilots, engineers, and instructors from the leading schools and air service companies in the United States.

Partial Outline of Contents

Opportunities in Aviation — Business of Flying—License Requirements—Your First Outfit—Airplanes, Amphibians, Seaplanes—Construction of Planes—Power Plants—Manufacture of Engines—Instruments—Airplane Design—Wings and Props—Wind and Weather—Plane Inspection—Learning to Fly—Advanced Flying—Laying an Air Course—Air Traffic—Laws of Aviation—History of Aviaton—Glossary—Miscellaneous Tables—Over 600 Pages—250 Illustrations and Diagrams.

Answers Every Aviation Que tion

Every man, whether beginner, pilot, mechanic, designer, manufacturer, or business executive, who is concerned with aviation has felt the need for such a handy authority to answer quickly his questions on all phases of aeronautics. Here is the whole subject completely covered in ONE single volume!

FREE EXAMINATION

THE AVIATION MANUAL will speak for itself better than the brief description possible here. Send for a copy "on approval" and see for yourself its remarkable value. Send no money now, only the coupon. After you have examined the book, you may remit the low price of $5.00, or return it to us. Send the coupon TODAY.

Order on this Coupon

POPULAR SCIENCE PUBLISHING CO.,
381 Fourth Ave., New York.

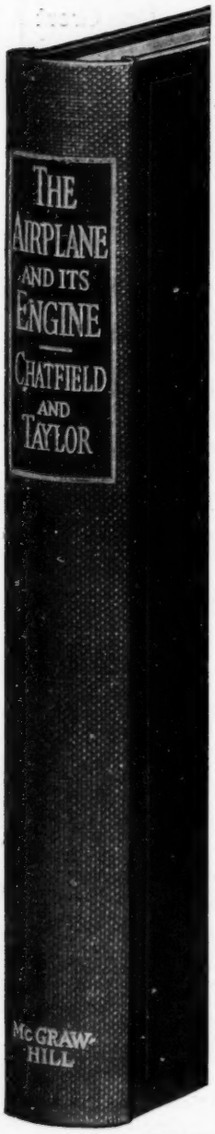
Please send me a copy of *The Aviation Manual*. Within ten days of receipt I will either return the book or remit $5.00.
(Aviation 1-30)

Name .....

Address .....

City .....State .....

AIRPLANE MECHANICS



Fundamental factors to be considered in design, construction and control of heavier-than-air craft.

The Airplane and Its Engine

By C. H. CHATFIELD and C. F. TAYLOR

Associate Professors in the Course in Aeronautical Engineering at the Massachusetts Institute of Technology.

HERE is a sound, clear and simple discussion of the fundamental principles, construction and capabilities of the airplane and its engine. The book strikes a mean between the simple "popular" aviation books and the highly technical works for the designing engineer.

Little mathematics has been used, and only a knowledge of elementary physics and mechanics is required. There are 209 photographs and diagrams.

the book covers such topics as:

—the lift of a wing—developing the theory from Newton's laws of motion
—the reason for wing shapes
—Monoplane and biplane arrangements
—Resistance of air to bodies in motion and airplane shapes designed to reduce this resistance
—Stability and airplane control
—the engine-basic principles and representative types
—the complete power plant
—construction of the modern airplane
—types of airplane, airplane instruments and accessories.

379 pages, 5½ x 8
209 illustrations, $2.50

SEE YOUR COPY FOR 10 DAYS FREE

Simply mail the coupon for your copy. No obligation to purchase—no agents—no red tape. Keep the book or send it back as you wish. It's one book every aviation man should have. Don't miss this chance to see it free.

McGRAW-HILL
FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York.

Send me Chatfield and Taylor's The Airplane and Its Engine, $2.50, for 10 days' free examination. I agree to return the book, postpaid, in ten days or to remit for it then.

Signed .....

Address .....

City and State .....

Official Position .....

Name of Company .....
(Books sent on approval in Continental U. S. and Canada only.) A.1-11-30

ALPHABETICAL INDEX TO ADVERTISEMENTS

Name	Number
Airtech School of Aviation	30
American Tar Products Co.	20
Austin Co., The	14
Axelson Aircraft Engine Co.	15
Bakelite Corp.	33
Barnes Co., Wallace	33
Baum, Seymour J., Inc.	37
B. B. T. Corporation of America	29
Bendix Brake Co.	10
Berliner-Joyce Aircraft Co., Inc.	36
Bethlehem Steel Co.	25
Black & Decker Mfg. Co.	2
Canvas Leather Specialty Co.	32
Carey Co., Phillip, The	27
Carrom Co., The	38
Cleveland Pneumatic Tool Co.	37
Continental Aircraft Engine Co.	8
Crouse-Hinds Co.	6
Cunningham-Hall Aircraft Corp.	38
Eagle Ottawa Leather Co.	38
Eclipse Aviation Corp.	Back Cover
Electric Storage Battery Co., The	46
Elgin National Watch Co.	32
Emsco Aircraft Corp.	21
Endicott Forging & Mfg. Co., Inc.	38
Federal Aircraft Corp.	31
General Electric Co. (Merchandise Division)	7
General Electric Supply Corp.	11
Gibson Co., The Wm. D.	28
Glidden Co., The	31
Govro-Nelson Co.	37
Gulf Refining Co.	9
Haskelite Mfg. Corp.	26
Indianapolis Tool & Mfg. Co.	36
Inland Aviation Company	23
International Aircraft Exposition	24
Jaeger Watch Co., Inc.	34
Johnson Airplane & Supply Co.	17
Kari-Keen Aircraft, Inc. & Subsidiaries	12
LeBlond Aircraft Engine Corp., The	34
McGraw-Hill Book Co.	44
Martin, Glenn L. Co., The	18
Maryland Metal Building Co. (Airport Equipment Division)	30
Meyrowitz, Inc., E. B.	37
National Fireproofing Co.	4
New Hampshire Aviation & Marine Co.	34
New York Aviation Show	36
Nicholas-Beazley Airplane Co., Inc.	36
Oakite Products Co.	28
Page Fence Association	35
Peck, Stow & Wilcox Co., The	34
Pitcairn Aircraft, Inc.	36
Pratt & Whitney Aircraft Co.	16
Scintilla Magneto Corp.	45
Searchlight	39-40-41-42-43

Name	Number
Service Steel Co.	36
Shelton Looms	35
Stanavo Specification Board	Inside Front Cover
Standard Oil Co. of N. Y.	13
Stout Metal Airplane Co.	5
Summerill Tubing Co.	38
Texas Co., The	19
Texas Pacific Coal & Oil Co.	3
U. S. Hammered Piston Ring Co.	38
Vacuum Oil Co.	Inside Back Cover
Universal Aviation Corp. (Robertson Division)	38
White Dental Mfg. Co., S. S., The	37

SEARCHLIGHT

Classified Advertising

BOOKS	42-43
BUSINESS OPPORTUNITIES	43
EMPLOYMENT SERVICE	43
EQUIPMENT WANTED	43
MISCELLANEOUS	43
POSITIONS VACANT	43
POSITIONS WANTED	43
SALESMEN WANTED	43
SCHOOLS MISCELLANEOUS	43
USED AND SURPLUS EQUIPMENT	41-42-43
WANTED MISCELLANEOUS	43
WORK WANTED	43

AIRCRAFT SERVICE DIRECTORY

All-American Glider Co.	40
Allen & Drew, Inc.	40
Beck Distributing Corp.	40
Boston Auto Gage Co.	40
Burgess Norton Mfg. Co.	40
Cox & Son, John S.	40
Frisbie Aircraft Products Co.	40
Haskelite Mfg. Co.	40
New York University	40
Pioneer Instrument Co.	40
Polachek, Z. H.	40
Rieker Instrument Co.	40
Strauss & Buegeleisen	40
Weis, Inc., Geo. A.	40
Westchester Airport Corp.	40

PROFESSIONAL SERVICES

Aircraft Engineers, Inc.	40
Gazley & Lasha	40
Lancaster & Allwine	40
Offenstein, C. L.	40
Stalker, Ed. A.	40

WHERE TO FLY

Pages	39

SCINTILLA

AIRCRAFT MAGNETOS

Are Selected Because of Their

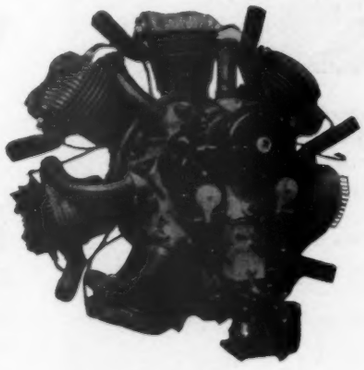
DEPENDABILITY
SIMPLICITY
ACCESSIBILITY

Scintilla Aircraft Magnetos can be obtained for engines of from one to eighteen cylinders.

Scintilla Aircraft Magnetos are Standard Equipment on Aircraft Engines Built by

Aero Development Co.
Aeromarine Plane & Motor Co.
Aeronautical Products Corp.
Aircraft Holding Corp.
Airman Engineering Co.
Alliance Aircraft Corp.
American Cirrus Engines, Inc.
Axelson Aircraft Engine Co.
Brownback Motor Laboratories, Inc.
Century Rotary Motor Corp.
Comet Engine Corp.
Continental Motors Corp.
Cross Gear & Engine Co.
Curtiss Aeroplane & Motor Co.
Fairchild Airplane Mfg. Corp.
Fischer & Jacobs, Inc.
General Airmotors Company
Hurricane Motor Co., Inc.
Kinner Airplane & Motor Co.
Lambert Aircraft Engine Corp. (Formerly Velie Motors Corp.)
Light Mfg. & Fdry. Co.
Lycoming Mfg. Co.
MacClatchie Mfg. Co.
Marchetti Motor Patents, Inc.
Menasco Motors Company
Michigan Aero-Engine Corp.
National Aero Corp.
Packard Motor Car Co.
Quick Air Motors Co.
Rocky Mt. Steel Products, Inc.
Spartan Aircraft Co.
Szekely Aircraft and Engine Company.
The Kimball Aircraft Corp.
The Le Blond Aircraft Engine Corp.
The Pratt & Whitney Aircraft Co.
Tips and Smith, Inc.
Warner Aircraft Corp.
Western Enterprise Corp.
Wright Aeronautical Corp.
Wright-Tuttle Aircraft Motors Corp.

One of a number of American Aircraft Engines equipped with Scintilla Aircraft Magnetos



MacClatchie "PANTHER"
Manufactured by American Cirrus Engines, Inc.

SCINTILLA PARTS DEALER SERVICE STATIONS

CHICAGO, ILL.
Illinois Auto Electric Co.
2460 Calumet Ave.

NEW YORK CITY
Manhattan Ignition Corp.
206 W. 68th Street

DETROIT, MICH.
Greenleaf, Inc.
3127 East Jefferson Ave.

PHILADELPHIA, PA.
J. W. Parkin, Jr., Ignition Specialist
2261 N. Broad St.

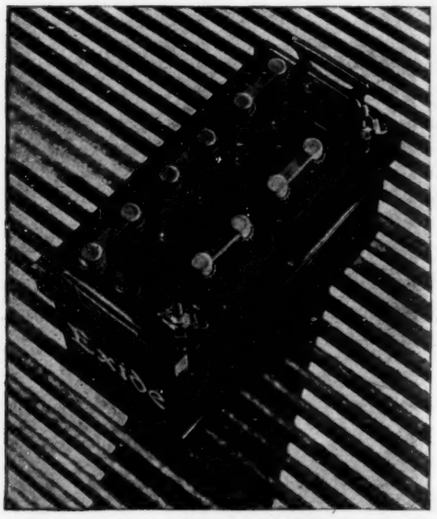
LOS ANGELES, CALIF.
Pacific Airmotive Corp.
3417 Angeles Mesa Drive

TULSA, OKLA.
Magneto Ignition Corp.
304 E. Second Street

W. PALM BEACH, FLA.
Sutcliffe's Automotive Electrical Service Co.
Corner First and Olive Sts.

SCINTILLA MAGNETO CO. INC.
SIDNEY - NEW YORK
Contractors to the U.S. Army and Navy

Landing lights can always be depended upon when Exide Batteries are on the job.



The Exide Aircraft Battery is specially designed for hard flying service.

Electrolyte will not spill *from these* Aircraft Batteries

UNDER all sorts of flying conditions, in tiny pursuit planes . . . giant transports . . . great dirigibles, Exide Aircraft Batteries have proved their absolutely dependable performance to pilots . . . owners . . . mechanics.

Exide Aircraft Batteries are built expressly to meet the gruelling requirements of flying service. For landing lights . . . navigation, instrument, and cabin lights . . . starting and ignition . . . for radio power . . . Exides are constructed to give maximum efficiency with minimum weight. And these batteries are specially designed so that the electrolyte will not spill.

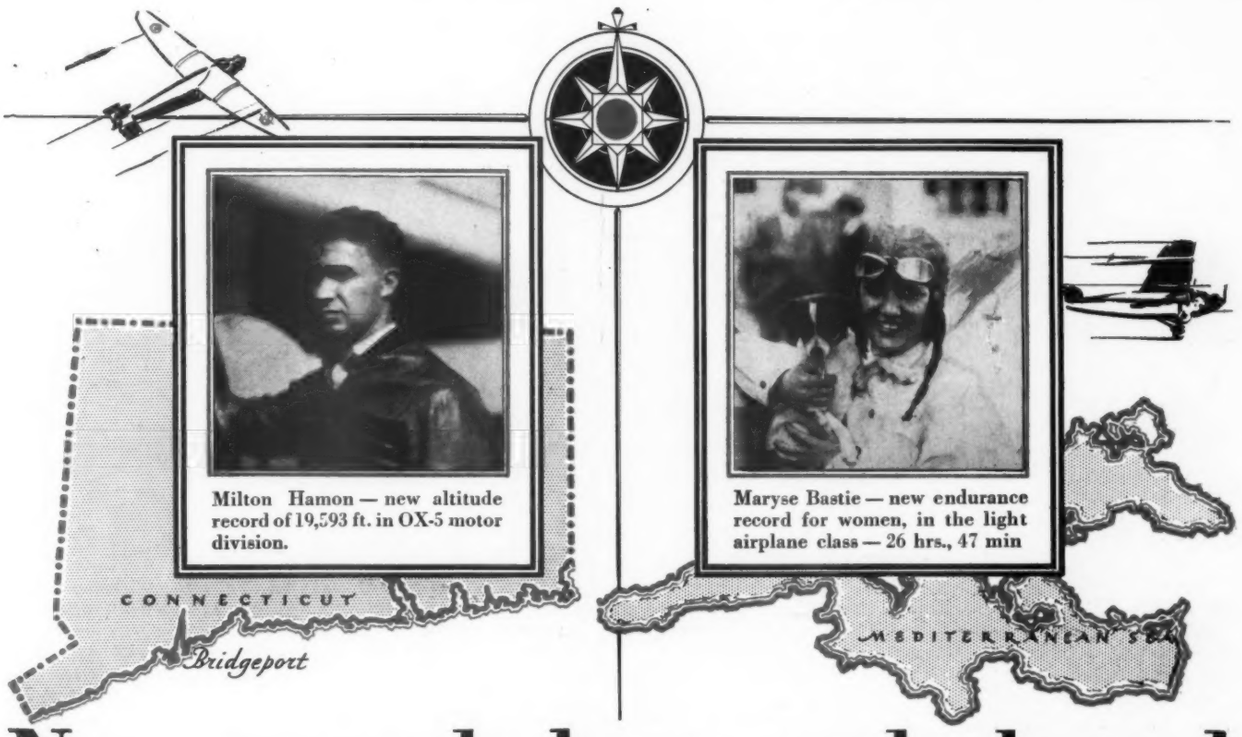
Numerous flying fields throughout the country are equipped for Exide sales and service. And there is an Exide representative in every important center. Get in touch with one or write for full information about the many types of reliable Exide Aircraft Batteries and their varied applications.

Exide
AIRCRAFT BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, Toronto

THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE



Milton Hamon — new altitude record of 19,593 ft. in OX-5 motor division.

Maryse Bastie — new endurance record for women, in the light airplane class — 26 hrs., 47 min

New records here and abroad with Mobiloil Aero Oils

When Milton Hamon of the Curtiss Flying Service soared 19,593 ft. over Bridgeport, Conn., in his Curtiss Robin for a new altitude record in the OX-5 motor division — his engine was lubricated with Mobiloil.

When Lena Bernstein, noted French flier, broke the world's distance record for light airplanes by piloting a Caudron monoplane more than 1550 miles over the Mediterranean Sea — Mobiloil Aero Oil assured unfailing performance in her sturdy Salmson engine. And when Maryse Bastie, another daring Frenchwoman, kept a Caudron plane of the same type in the air at Bordeaux, France, 26 hours, 47 minutes, for a new women's endurance record in the light airplane class—she relied on Mobiloil Aero Oil.

With Mobiloil Aero Oils, you obtain; —

—"Double-Range"—easy starting and prompt oil distribution at low temperatures, *plus* full body and efficient lubrication at high speeds, under severe heat and load conditions.

—Less carbon deposit — cleaner burning under all conditions.

—Reduction in gumming tendency on valves and rings.

—Decreased screen clogging.

—*Longer life*—remarkable reduction in oil consumption.

Mobiloil Aero Oils are on sale at established airports throughout the world.

VACUUM OIL COMPANY

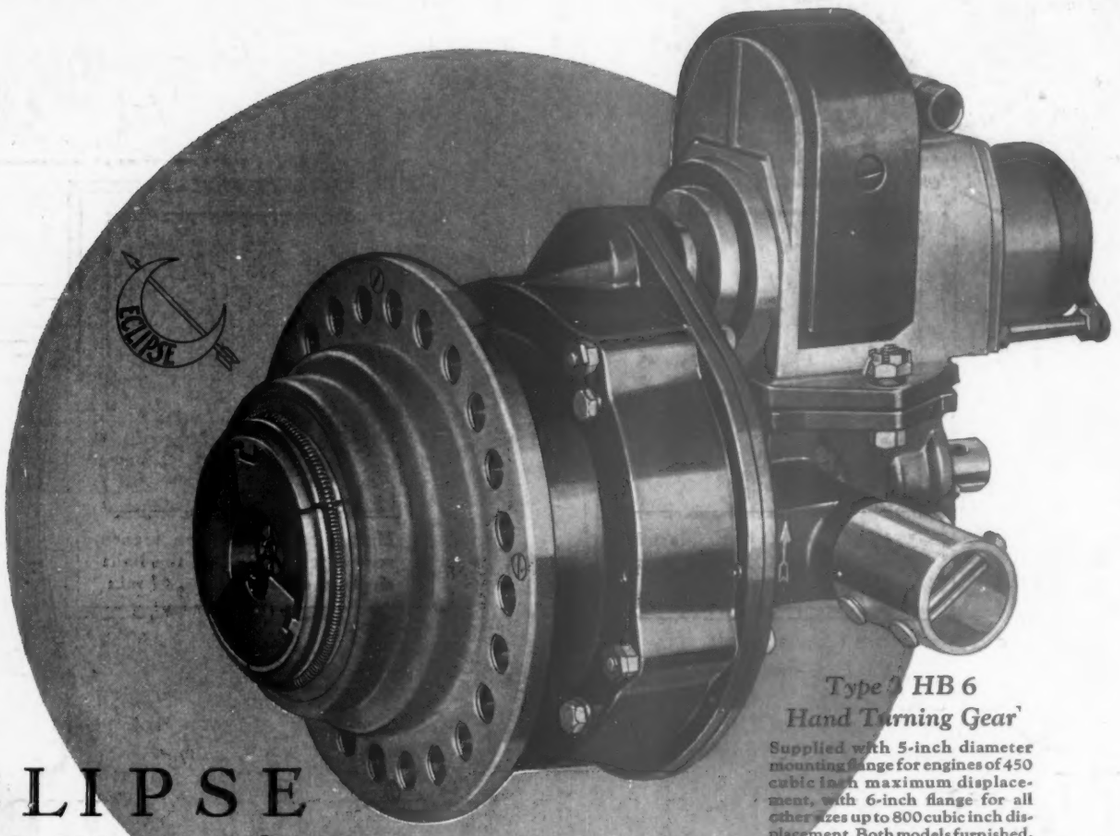
Makers of high quality lubricants for all types of machinery

the New GARGOYLE

Mobiloil

AERO OILS

FOR ROCKER-ARM LUBRICATION USE MOBILGREASE



Type 3 HB 6
Hand Turning Gear

Supplied with 5-inch diameter mounting flange for engines of 450 cubic inch maximum displacement, with 6-inch flange for all other sizes up to 800 cubic inch displacement. Both models furnished, arranged for either side or rear cranking. Weight of starter (including magneto) is but 17½ pounds

ECLIPSE
Aircraft Engine Starters and Generators

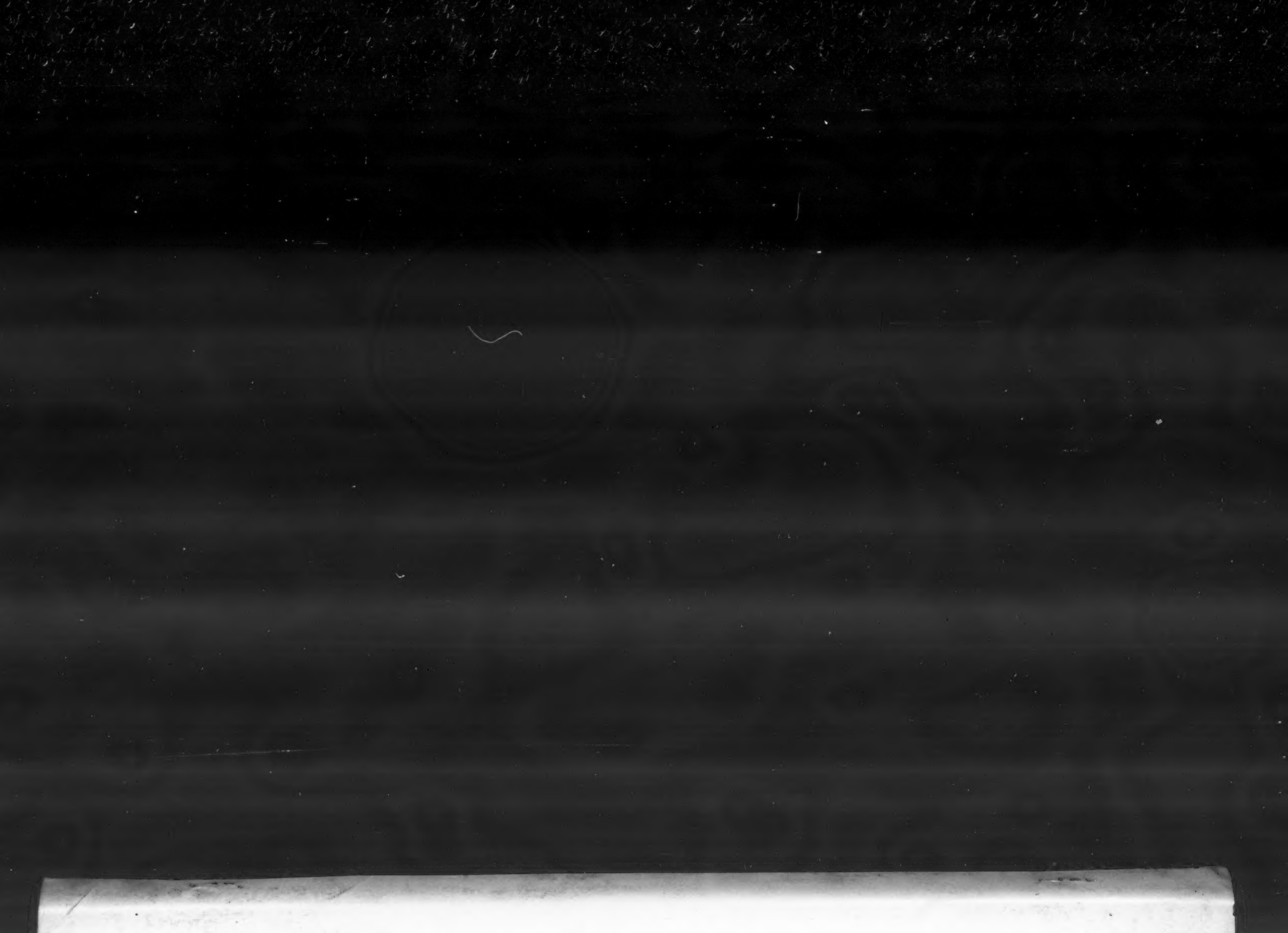
The type 3 HB 6 Eclipse Aviation Hand Turning Gear is designed to crank the engine directly by hand power. It provides safe, dependable starting with a minimum of weight, and has proven its ability to deliver satisfactory performance on many commercial planes.

The starter consists of a reduction gear, operating an automatic meshing and demeshing mechanism through an adjustable torque overload release. This construction safeguards both the operator and the starter in case of backfire.

For easy starting, the Eclipse Aviation Hand Turning Gear is provided with a booster magneto geared to operate at high speed, thus furnishing a hot spark at low engine cranking speed.

ECLIPSE AVIATION CORPORATION

EAST ORANGE, NEW JERSEY

(Division of Bendix Aviation Corporation)

TACOMA PUBLIC LIBRARY